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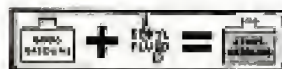
# Take a LOOK at the private life of Ethyl Gasoline

**M**OST regular gasoline has hysterics when you call on it for extra work. It literally blows up—wastes its power in harmful knock. But *Ethyl Gasoline* delivers power with a smoothly increasing pressure that makes your car run at its best.

Just recently a group of engineers played detective on gasoline. Through thick quartz glass windows they snooped into its private life. With special high-speed cameras, they took photographs of the actual combustion of motor fuels.

Look at the pictures below. On the left, a typical photograph of the antics of ordinary gasoline in a modern high compression engine. Compare it with the picture on the right. There's Ethyl Gasoline burning smoothly, steadily—producing *more* power and *less* wasteful, harmful heat.

Behind your wheel you *feel* this difference. Ethyl Gasoline gives you the utmost performance of your car over every inch that you drive. It protects your motor from wear-and-tear, from the waste of excessive choking in starting, and overheating on long runs. Ethyl Gasoline Corporation, New York City.



Ethyl fluid contains lead.

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## Slow-motion movies of gasoline combustion



**UNEVEN COMBUSTION** of ordinary gasoline. Through a quartz window in the cylinder head of a modern high compression motor, Detroit engineers took this photograph of the uneven, wasteful explosion of ordinary gasoline. That white-hot vertical line shows the instant of knock.



**SMOOTH COMBUSTION** of Ethyl Gasoline. There's no trace of knock here. Note the even progress of the flame—the greater spread of power. Ethyl controls combustion; delivers more of its power to the pistons—leaving *less* waste heat. It brings out the best performance of any car.

# Buy ETHYL GASOLINE



# What is *Bi-Acoustic* Radio?



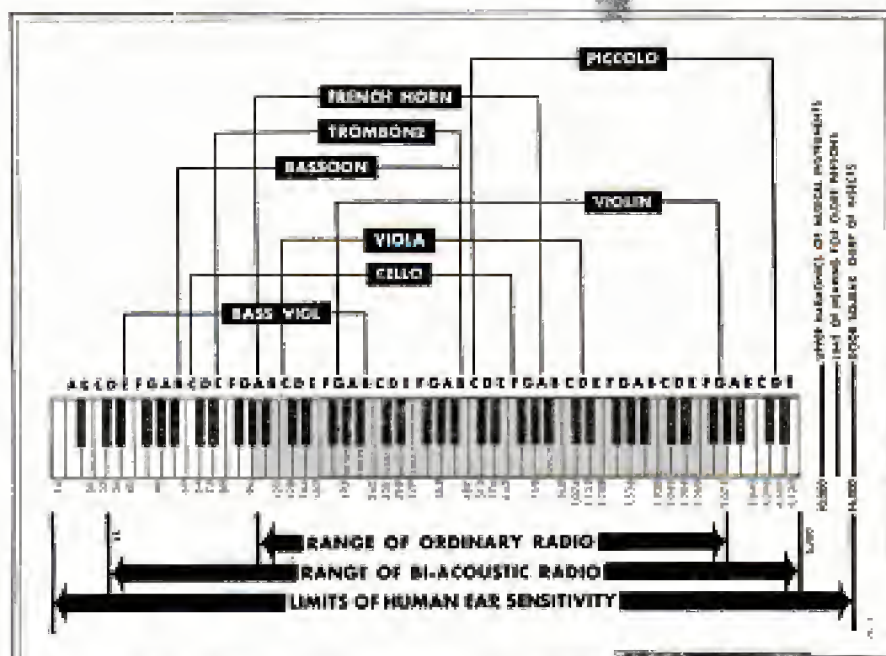
*A simple technical explanation of this marvelous new RCA Victor Radio that gives 2 more octaves of music*

A few weeks ago, RCA Victor introduced its latest, newest radio . . . the Bi-Acoustic. Thousands upon thousands who have heard it, marvel. This new radio has something others have always lacked. What is it?

It's the radio that adds two full octaves of music (amounting in the full orchestra to 206 extra musical tones) . . . in short, it is "Bi-Acoustic." We use the word "Acoustic" because this radio represents a tremendous advance in the perfection of tone quality, fidelity and frequency range, all of which are acoustical properties. We use the prefix "Bi" (the symbol for twofold), for in this new circuit there is twice the range, twice the reserve power, twice the tone quality.

## Marked by 9 New Features

Nine sensational advancements make Bi-Acoustic Tone possible. Specifically, the new Bi-Acoustic radio incorporates the following features: (1) "B" Amplification increases fidelity, prevents amplifier "overspill." (2) Automatic Tone Compensation increases audibility, removes metallic harshness of sound at low volume levels. (3) Dual Automatic Volume Control reduces noise between stations, holds volume at the level you want—always. (4) Extended Musical Range makes possible the reproduction of two additional octaves, as shown in the above scale chart. You hear full, true notes you have never really heard before—piano notes, piccolo notes, saxophone notes. (5) Tone Equalizers prevent cabinet "boom." (6) An Improved Loud Speaker brings final reproduction still closer to the original performance. (7) New



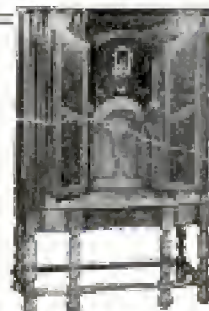
This scale chart shows you exactly how much more music you get in a Bi-Acoustic Radio—two full octaves amounting to 206 extra musical tones.

Type Radiotrons improve operating efficiency. (8) The new "Background" Noise Suppressor. (9) New Cabinetry, splendid in appearance, provides ample baffle area for the creation of the finest tone in radio.

## You Hear ALL Tones

These features make possible the first radio to actually duplicate a broadcast—rather than merely approximate it. All in all, technically and acoustically, this new radio reaches the apex of performance.

Come in to any RCA Victor dealer, listen to, and examine the mechanics of this instrument. Put it to any test you want—it will win. There is no obligation, for whether you buy or not, we would like you to see and hear it. Frankly, we believe you will be amazed!



THE NEW "BI-ACOUSTIC"—16-inch Super-Heterodyne with "B" Amplification, Advanced Automatic Tone Compensator, Tone Equalizers, Dual Automatic Volume Control, Noise Suppressor, Micro Tone Control.

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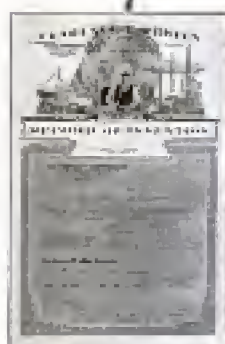
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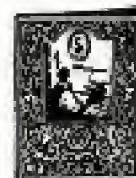
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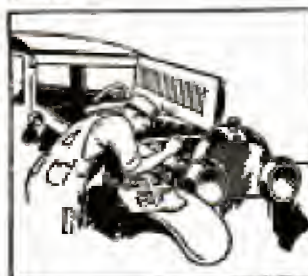
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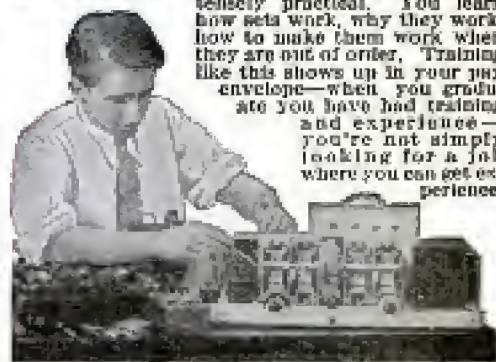
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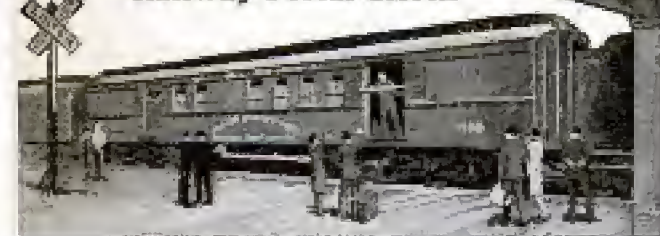
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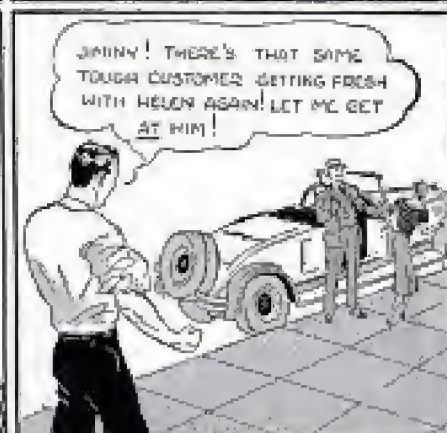
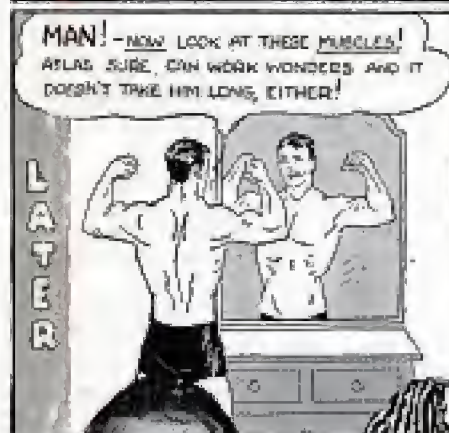
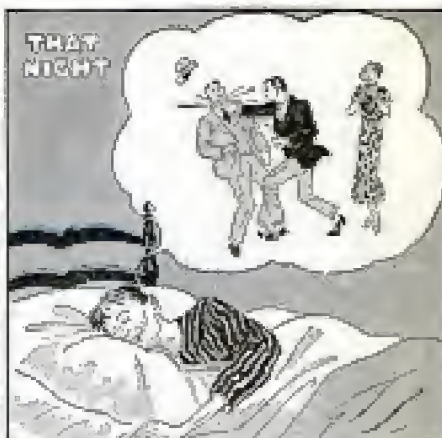
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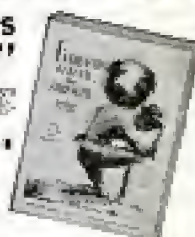
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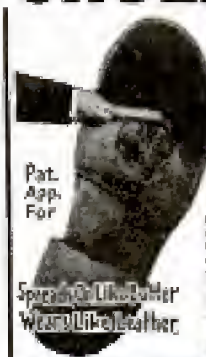


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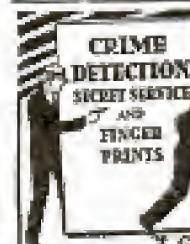
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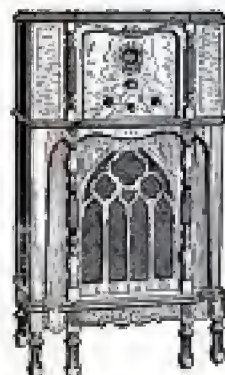
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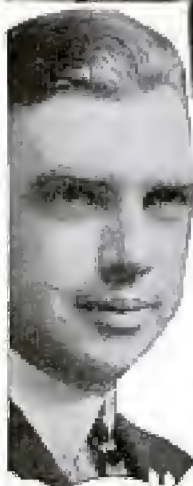
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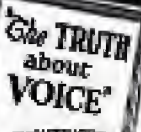
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State of Illinois, County of Cook, ss.  
I, H. H. Winsor, Jr., being duly sworn, depose and say that he is the editor and publisher of the Popular Mechanics Magazine and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 411, Postal Laws and Regulations, printed on the reverse of the form, to-wit: First, That the name and address of the publisher, editor, managing editor, and business manager are: Publisher, Popular Mechanics Co., 300 East Ontario St., Chicago, Ill., Editor, H. H. Winsor, Jr., 200 East Ontario St., Chicago, Ill., Managing Editor, L. R. Weber, 200 East Ontario St., Chicago, Ill., Business Manager, W. J. Kuecker, 200 East Ontario St., Chicago, Ill. Second, That the owner is (1) owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorporated concern, its name and address, as well as those of each individual member, must be given. Popular Mechanics Company, 300 East Ontario St., Chicago, Ill., L. R. Weber, 200 East Ontario St., Chicago, Ill., H. H. Winsor, Jr., 200 East Ontario St., Chicago, Ill. Third, That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgagees, or other securities and if there are none, so state. None. Fourth, That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, also that the said two paragraphs contain statements verifying affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of bona fide owners; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him. H. H. WINSOR, Jr., Editor and Publisher. Sworn to and subscribed before me this 29th day of September, 1932. J. GRHAMM, Notary Public. My commission expires January 1, 1933.

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**HAVE** You a camera? Write for free sample of our big magazine, showing how to make better pictures and earn money. American Photography, 118 Camera House, Boston, U. S. A.

**YOUR** Favorite Kodak picture enlarged, size 3x7, 10c. Three for quarter, coin. Send best negative (film) today. Address: Danner Photo Lab., 221 Securities Bldg., Des Moines, Iowa.

#### MOTION PICTURES AND SOUND EQUIPMENT

**BASS**, Camera Bargain Headquarters, offers 100-ft. capacity Peko automatic spring driven 16mm. motion picture camera with f3.5 lens and water-proof case, worth \$50.00, at \$22.50, with money back guarantee. Fresh Eastman film, 100 ft., nonchromatic reversible, includes developing at \$4.80. Hundreds of other bargains listed in the great Bass Bargaingram No. 109. Copy on receipt of 5c to stamps. Bass Camera Company, 178 W. Madison Street, Chicago, Ill.

**\$1.250** FOR Original photoplay story. Our sales department sold unknown author's first story for above amount. We receive copyright and submit to studios stories for talking pictures. Being located in the heart of motion picture industry we know production requirements. Established 1917. Free booklet. Universal Scenario Company, 206 Meyer Bldg., Western and Sierra Vista, Hollywood, Calif.

**TALKIE** And movie producers are clamoring for new short story ideas, plots, etc. Perhaps you can write one that we can shape and sell for you. One writer (V.M.) received \$3,400. New York best market. Write now for free booklet, without obligation. How To Write For the Talkies! Daniel O'Malley Company Inc., Suite P, 1770 Broadway, New York.

**ART** Film 100 ft. 16mm \$3.00. Sound attachments, 400' reels 33c; humidors 45c; cement 20c. 30x40 crystal roller beaded screen \$4.85. Eastman splicing \$1.25. Free library membership. Lists. Mogul Bros., 1914-J Boston Road, N. Y. C.

**MOVIE** Camera bargains. Films, slightly used, B & H, F3.5, \$29.50 with case, was \$49. Kertone 16 mm. motor drive F3.5, like new, \$19.50, was \$33. Universal 35 mm. 200 ft., F3.5 lens, with tripod \$95, was \$150. Many others. Free bargain catalog No. 138 just out. Norman-Willets Company, 318 W. Washington St., Chicago.

**HOLIDAY** Bargains. 35mm. and 16mm. and reels, \$1.00 plus postage. Lists 2c. Hoffman Film Service, 87 Broad, Albany, New York.

**WORLD'S** Greatest "Passion Play" 16 MM. (new) 5 reels. Rent or purchase. Write Hemenway Film Co., 57 Church Street, Boston, Mass.

**SOUND** Reel with record, twelve dollars. One hundred foot comedies \$2.50. Motor driven Biograph projector \$17.50. Film for camera—Kia-O-Lux Sun Ray \$3, Eastman-Stewart Warner \$4.50. Milton Mendelsinger, 192 Ave. B, Bayonne, N. J.

**WESTERN** Reels \$1.50, 500 feet \$1.00. Jester Films, 2050 Chesterland, Lakewood, Ohio.

**16MM** MOVIE Equipment, Bargain lists free. Elder, Dept. A-12, Chelsea, Mass.

**LEARN** Theatre management at home. Unusual opportunities. Free catalog. Theatre Managers Institute, Elmhurst, New York.

**16MM** QRS Projector \$3.05, Popular Star films 35c up. Free bargain lists. Home Movies, Box 32, Easton, Pennsylvania.

**16mm** FILMS, 100 Feet, \$2.25. Send dime for big catalogue and usable source list. Eastin Films, Galeburg, Ill.

#### TRADE AND TECHNICAL SCHOOLS

**OWN** Your own business! Learn shoe re-building, hat repairing, clothes pressing. Enormous profits. Catalogue free. Gulas, Inc., T-T W, Division, Chicago.

**LEARN** Watch repairing. Hilts School, 6330 Mission St., San Francisco.

**MODEL** Of Jimmy Doolittle's record-breaking transcontinental racing plane detailed in blueprint \$3.95, for 25c. Room 510, Popular Mechanics, 200 E. Ontario, Chicago.

#### BUSINESS OPPORTUNITIES

**PLASTEX** Industries offer industrious men an opportunity to start a business of their own, manufacturing art goods, novelties, novelties, etc. In Plastex and marble imitation. 5c material makes \$1 articles. Rubber moulds furnished for speed production. Small investment brings big returns. Big X-mas business starts this month. You are just in time. Write for interesting booklet mailed free. Plastex Industries, Dept. A, 1055 Washington Ave., New York.

**START** in business in your own kitchen. Cake doughnuts—fastest selling food product. Baked by electricity—new kinds and flavors. No canning. Sell output to stores. Strikely cash year-round business. 35% profits. Less than \$50 total investment. Free particulars. Hinker Co., 64 Main St., Minneapolis, Minn.

**\$1.50** STARTS You. Brand new business, \$50.00 week up possible. Mr. Boyer, 3828 Arden St., Los Angeles, Cal.

**BARGAINS**—Paint spray outfit, gasoline engine drive, Texas—trial. Helmsick Paint Spray Exchange, Box M-1222, Troy, Ohio.

**"MAKE** Big money!" Raising giant bullfrogs! (Your backyard.) We buy them, furnish breeders and instructions. American Bullfrog Industries, 100-P, Fremont, Ohio.

**MAIL** Order and light manufacturing business—50% profit selling typewriter ribbons. Patented machine makes best \$1.00 ribbon for 15c. Every office a repeating prospect, monthly. Send 30c for sample and complete mail order plan. Ribbon Ink Corporation, 260 N. Michigan, Chicago.

**AUTO** Door utility pocket-road map, pipes, cigarettes, etc., always in place. Sample 5c cents. The Furnishers Studio, Wilmette, Illinois.

**OPERATE** Dignified business, assured profits. Guaranteed plans \$1.00. Money refunded if plans fail. Doctors' Protective Association, Fort Worth, Texas.

**START** 1933 Right! Making successful products from guaranteed formulas. No machinery needed. Profits great! Metallic roll solder; Water Wax; Plaidura; Polish-niter; Oilster; Dry Anti-freeze; latest advertised specialties, all lines. Get my 36th unequalled free anniversary offer. Miller, Chemist, 1760B, Tampa, Florida.

**EARN** Up to \$25 weekly or more growing mushrooms in your cellar or shed. Illustrated booklet free. American Mushroom Industries, Ltd., Dept. 331, Toronto, Ont.

**SIGNS** And showcards, paint them yourself with letter patterns. So simple a child can do it. Just trace pattern and fill in. Write for free samples. John Kahn, A2139 Nava Ave., Chicago.

**ARE** You old at forty? See our advertisement on page 28A of this issue. The Electro Thermal Company, 2149 Morris Ave., Stauntonville, Ohio.

**"HOMEWORK"** 24 Plans 50c. Homework Service, 243 Willard, Toledo, Ohio.



**MAKE** Artificial marble, colorful glossy tiles, no polishing; rather uncanny. Novelties, tablecloths, bookends, floors, whetstones. Hard, inexpensive, fireproof, enamel wood. Secret cement methods. Amazing samples. Se. John A. Papp, 945 Grande Vista Drive, Los Angeles, Calif.

**MAIL** Order drug store. Let us supply your drug store wants. Magoon Drug Store, Thibaultville, Wis.

**SUCCEED** With your own products. Make-sell them yourself. Formulas, processes, trade-secrets. Analytical service. Catalog free. B. Thaxby Company, Washington, D. C.

**MANUFACTURE** Chipped glass house numbers. Berridge, 166-22 Locust, Jamaica, New York.

**SEND** Your name on post card. Receive three free books. Mail order business. 3c postage appreciated. Dolson Herald, 36 Liberty St., Brooklyn, New York.

**STEADY** income with "chain" of amusement and merchandising vending machines. Start small capital. Robbins Corp., DeKalb and Broadway, Brooklyn, New York.

**EARN** Upwards of \$20 weekly growing mushrooms, all fall and winter, in cellars or outbuildings. Ready market. Begin now. Illustrated booklet free. Established 25 years. Adams Mushroom Co., Dept. 147, Toronto 10, Canada.

**"SCHEMER** Magazine," Alliance, Ohio, pays 50% dividend. Copy and dollar dividend blank, only 10c.

**"KEY** To Business Opportunities," 30 page booklet free. General Service Bureau, Box 627, Buffalo, N. Y.

**I MADE** \$30.00 Weekly remaking colors in rugs, upholstery, etc. Free booklet explains. Alhambra Laboratories, Box 41, Alhambra, Calif.

**CHEMICAL** Expert furnishes manufacturing formulas with complete working directions. Reliable individual service. Charges reasonable. Dr. VanHarden, 4721 Lakewood, Chicago.

**NEW** Plan sure fire by mail. Gets agents. They pile up profits. Details stamp, or plan \$1.00. John F. Coleman, Box 14-P, Smithburg, New York.

**POPCORN** Machines, all types, lowest prices. Northside Co., 2117 Harding, Des Moines, Iowa.

**MANUFACTURE** Sell your own beverages, extracts, candies, soaps, perfumes, etc. Free booklet. Truway Laboratories, 1333 Walton St., Chicago.

**AMATEUR** Cartoonists: Sell your work, Write Smith's Service, FW1194, Wenatchee, Wash.

**700 MONEY** Making secrets will help you start a business of your own. Write Illinois Universal, 800 N. Central Ave., Chicago.

**SELL** By mail. Books, novelties, magazines. Large profits. Particulars free. R. Eyles, 535 S. Dearborn, Chicago.

**MILIONS** Realized at home. Costs near 5 cents per square foot; you charge 50 cents. Profitable business plating like new brass worn-off autographs, reflectors, tableware, stoves, etc. Outfits furnished. Details free. Sprinkle, Plaster, 127 Marion, Ind.

**BIG** Money at home plating auto parts, reflectors, mirrors, chandeliers; by new method; experience unnecessary. Outfits furnished. Gummett Co., Ave. N. Decatur, Ill.

**FORMULAS**—Our literature will surprise you. Belfort, 4042 N. Keefer, Chicago.

**START** little business anywhere. Everything furnished. No canvassing. Maywood, PM 923 Broadway, New York.

**WHOLESALE** Directory 300,000 articles 10c. Other valuable information. Moran Company, Wareham, Massachusetts.

**FREE** Booklet describes 87 plans for making \$30-\$100 weekly in home or office business of your own. Elite Co., 214 Grand St., New York.

**GRANDFATHER** Clock case, colonial type, ideal for electric movement, described on blueprint SN 301 for 25c. Room 510, Popular Mechanics, 200 E. Ontario, Chicago.

**CHEMICAL** Expert will furnish formulas and trade secrets. All lines. Lists free. W. L. Cummings, Ph. D., 223 Gordon Ave., Syracuse, N. Y.

**LEARN** The collection business. Good income, quick results. Interesting booklet, "Skillful Collecting" free. National Collectors Assn., Long St., Newark, Ohio.

**CHARTERS:** Delaware; best, cheapest; free form. Colonial Charter Co., Wilmington, Del.

**OPERATE** Chain of renting and amusement machines. Be independent for life. Start small, grow big. P. Goodbody, 1828 East Main Street, Rochester, N. Y.

**A BUSINESS** Of your own making—Sparkling Glass Name and Number plates. Checkers/markers, signs. Big book and sample free. E. Palmer, 510 Wooster, Ohio.

**ARTIFICIAL** Marble sanitary flooring. Instructions covering wood or cement flooring  $\frac{1}{2}$  inch thick, fireproof, all colors, low cost. Ornamental cutting, concrete plaster paper-mache decorations, garden furniture, statuary, flexible molds, particulate and illustrations free. Chas. Mahler, Elmont, N. Y.

**MAKE** Your own products. Employ agents yourself. Toilet articles, soap, extracts. We furnish everything. Valuable book free. National Scientific Laboratories, 1950 W. Broad, Richmond, Va.

## CHEMISTRY

**SEND** 25c For new illustrated chemical experiment book with 207 formulas and tests. Catalogue of apparatus and chemicals free. J. Winn, 114 West 23rd, New York City.

**CHEMICAL** Consultation. Analytical service. Formulas rectified. Processes developed. Submit your problem. C. Thaxby Co., Washington, D. C.

**FOR** Sale. Information, marvelous discovery. World wide market. Perpetual income. Viola DeFrene, Hamilton, Mont.

**CHEMISTS:** 1933 Bargain list covering 2000 laboratory items 10c. 288 page catalogue 50c. Laboratory Materials Co., 613 E. 71st St., Chicago, Ill.

**JOIN**—American Amateur Chemists Society Journal, particulars 10c. Lansing, Mich.

**ANALYSIS.** Chemical consultation, processes, manufacturing plans. Guaranteed formulas. Small investment. Write, Associated Chemists, Indianapolis, Indiana.

**HANDBOOK** For chemical experimenters. Hundreds of experiments, illustrated, 50c. Booklet of experiments 10c. 1932-33 chemical apparatus catalogue 10c. Lowest prices. General Chemical Co., Reading, Penna.

**BOY** Mechanic—Famous library of 4 volumes covers the building of everything a boy might want to make. A great boon to parents and teachers. Actually covers 4000 different articles. Each volume 400 pages, fully illustrated. 450th. Price \$2.00 or set of 4 vols.—\$7.00 postpaid upon receipt of price or C.O.D. anywhere in the U. S. A. Popular Mechanics Press, Room 803, 200 E. Ontario St., Chicago.

## FORMULAS AND TRADE SECRETS

**TRANSFERINE:** Transfers pictures from papers to cloth, etc. Formula 50c. J. C. Howell, Arlington, Oregon.

**GUARANTEED** Automobile radiator anti-freeze mixture. Formula \$1.00. Also cosmetic and pharmaceutical formulas. Cleveland Laboratories, 711 Cleveland Street, Brooklyn, N. Y.

**FREE**—1933 Formula catalog. Money-making. Western Chemical, Salem, Oregon.

**SUPERIOR** Formula: Complete manufacturing information for automobile batteries, particulars free. "Molab," 3222 Dickens, Chicago.

**SUCCEED** With your own products. Make-sell them yourself. Formulas, processes, trade-secrets. Analytical service. Catalog free. B. Thaxby Company, Washington, D. C.

**OWN** A business—Make products with guaranteed formulas, trade secrets. Catalog free. Industrial Institute, A-12, 360 N. Michigan, Chicago.

**TESTED** Formulas. Newest, guaranteed. Catalog free. Grinstead Laboratory, Edwardsville, Illinois.

**FORMULAS,** Business plans, Literature free. Belfort, 4042 N. Keefer, Chicago.

**500 FORMULAS** And big illustrated catalog 25c. Ideal Book Shop, Park Ridge, Ill.

**METALLIC** Liquid solder formula \$5.00. Guaranteed, made up samples 20c. Electro-Thermo Works, Peoria, Ill.

**15,000 PROFIT** Making formulas. Following and many others: Accidents and emergencies, agriculture, alloys and amalgams, artist's materials, beverages, cements, glues, pastes, mullages, bleaching, renovating, coloring metals, drying glass, heat treatment of metals, household formulas, ice cream, confectionery, chewing gum, lapidary work, exterminating vermin, lubricants, paints, varnishes, photography, condiments, canning formulas, rubber, soap, candles, soldering, toilet preparations, perfumes, waterproofing, fireproofing, writing materials. Just write for "Scientific American Encyclopedia of Formulas." When postman hands you book pay \$5.00 and postal charges. Popular Mechanics Press, Room 802, 200 E. Ontario St., Chicago, Ill.

**"TESTING** Precious metals with Touch-stone"—practical booklet on buying old jewelry, dentures; detects platinum, palladium, gold. 50c. Jewelers Advice, 22 Albany, N. Y. City.

**FORMULAS,** All kinds. Guaranteed. Catalog free. Kemica, 31 Parkridge, Ill.

**COOK'S** Auto formulas. No guess work. Try samples finished products. Also chemicals, cans, containers for beginners. Geo. E. Cook, Box 281, Oyster Bay, N. Y.

**1,000,000 FORMULAS,** Industrial facts, tables, processes, rules, trade secrets, and calculations for all kinds of Trades and Businesses. Book—"Moore's Assistant"—1016 pages. Send postpaid for \$2.00. Ogilvie Publishing Co., 57 Rose St., Dept. 22, New York.

**1100 SELECT** Formulas. 25th anniversary offer. Free materials for specialties worth \$47.00. Valuable selling systems, all free! Stamp brings amazing offer! Miller, Chemist, 1700EP, Tampa, Florida.

**MAKE** Your own products. Employ agents yourself. Toilet articles, soap, extracts. We furnish everything. Valuable book free. National Scientific Laboratories, 1950W, Broad, Richmond, Va.

## AGENTS WANTED

**MAGIC** Gas stove appliances. Cooks meals in half time at half cost. Pays for itself first 30 days. Actually puts money in pockets of purchasers. No sales resistance. 200% profit. Guaranteed. Agents—crew managers—write quick. A few choice territories still open. Economy Appliances, 1213 Van Huron, Dept. A-20, Chicago.

**SELL** Personal Christmas cards! 20 for \$1.25; your profit 60c. Sample box with your name 50c. Westworth Co., 177 Milk St., Boston, Mass.

**500% PROFIT!** Gold and colored sign letters for windows, offices, trucks, signs. Monograms. Easily applied. Permanent business. Neonite, Akron, Ohio.

**BIG** Profits selling household specialties. Write Novotny Products Co., Montgomery, Minnesota.

**DISTRIBUTORS**—Capable organizing women crews. New remarkable necessity. Women buy on sight. Sensational profits. No competition. Takahon, Dept. K, 103 Park Ave., New York.

**300% PROFIT** Selling new "20-in-1" kitchen utensil. Details 25c. Costs you \$1.00 a dozen. Sample 10c. New Method Co., Dept. PM-13, Bradford, Pa.

**JUST** Invented—New oil burner. Fits in any stove or furnace. Burns cheap oil. Fully guaranteed; 100% profit. Free sample offer. Protected territory. International Oil Heating Company, Dept. C-13, St. Louis, Mo.

**NEW** Rubber goods line. 47 revolutionary inventions. Homes, offices buy instantly. Agents cleaning up \$30 weekly. Outfit free. Krieger Mfg., Box 1442, Akron, Ohio.

**100% PROFIT!** Coal carburetor cuts coal bill 50%. Details \$0.85, costs you \$1.85. Details free. Get your sample now and reserve territory. Franklin Stone Manufacturing Company, 40 Clinton Street, Newark, New Jersey.

**AMAZING** Liquid solder sticks light to metals, leather, wood, pottery, etc. No heat, acid, skill needed. 200% profit to agents. Write Menalt Co., Dept. 243-A, Delphos, Ohio.

**MYSTERY** Cord set! Does entire ironing automatically. Prevents scorching. Saves electricity. For telephones also. Approved Good Housekeeping, 100% profit. Samples furnished. Neverknot, Dept. 12-A, 4503 Ravenswood, Chicago.

**NEW** Invention pays large daily profits; cleans, polishes instantly furniture, automobiles, glass, metal, without cloth or other polishes; light to carry, amazingly fast 25c seller; big repertory; write quick. I. D. Shef, Union City, N. J.

**OUR** Wonderful luminous crucifixes and religious statues still lead the parade for results. Shine brilliantly in the dark. Sell on first demonstration. W. G. Hannan Co., 2530 So. State St., Chicago.

**AGENTS** Wanted for patented ladies heat protector, auto or office use. Double your money. Send 25c for samples. Act now; secure territorial rights. Protokshu Manufacturing, Inc., Pacific Building, Oakland, California.

**JUST** Out—New automatic machine kills ice box "halitosis"! Actually "breathes" air—ends waste. Homes, stores buy on sight. Up to \$5 an hour. Amazing test offer. Write quick! St. Louis Mfg. Co., Dept. W, Carter & Warne Area, St. Louis, Mo.



**MAKE** Your own products. Employ agents yourself. Toilet articles, soap, extracts. We furnish everything. Valuable book free. National Scientific Laboratories, 1950W Broad, Richmond, Va.

**AMAZING** Profits with "No Frost." Keep auto windshields, show-windows, etc., absolutely clear of frost, mist, steam, rain, sleet and snow. Makes wonderful demonstration. Pocket package. Tremendous seller. Big profits. Investigate sure. Albert Mills, 1820 Monmouth, Cincinnati, Ohio.

**DOUBLE-EYED** Self-threading needle packages, size 3/8, blind people thread them. Samples, particulars. 25c. Agents wanted. Wm. Oglesby, Vandalia, Ill.

**400% PROFIT** Selling signs used everywhere. Largest selection, wonderful repeat business. \$1.00 worth samples, 25c; 50 signs \$1.00. 100 signs, \$5.00. P. Franklin Co., 3323 Third Ave., N. Y. C.

**PURSE-LITE.** Just out. Big 25c seller. L. Price, Minneapolis, Minn.

**DISTRIBUTORS** And agents for Soderlie, the original metal base fluid solder. No heat or acid. Solder almost everything. Small amount of cash. See full page advertisement Popular Mechanics Shop Notes. Fluid Solder Products Co., Van Wert, Ohio.

**"SPARKLE Polish"** repeats; profits big; sample free. J. Hame, 3049 Metropolitan, Chicago.

**HAN-DEE** Cloth quickly polishes all metals. Representatives enthusiastic over easy sales—quick profits. Demonstrating sample free. Buskin Company, 1501 Euclid, Cleveland, Ind.

**A SELLING Miracle!** Profits from the new Rice-Way line abound even seasoned veterans of selling. New plan solves problem of depression money-making. Write at once for full details. Rice-Way Products Co., Dept. W-146, 4287 Warner Ave., St. Louis, Missouri.

**ENGRAVED** Name plates, signs, number plates, desk plates, window signs, etc., profitable large. Brett Bros., Winthrop, Mass.

**MAKE** Products yourself. Tested formulas—Catalog free. Grinstead Laboratory, Edwardsville, Illinois.

**NEW** Invention. Attachment for electric bulb perfumes home. Novel. Fascinating. Everybody buys. Repeats. 25c brings outfit. Warner Mfg. Co., 125 Court St., Brooklyn, N. Y.

**HOO-RAY** Game. Hundreds can play. Brand new. For theatres, dances, parties, merchants advertising stunt, etc. Unusual opportunity salesman. Hoo-Ray Game Co., 110 Cooper Bldg., Denver, Colo.

**WHOLESALE** Dealers' directory: 124 pages. Free circular. Maywood, 921 Broadway, New York.

**NEON** Tubes now available to experimenters and others. Straight two foot lengths. Red, blue, green. Set with transformer and everything to operate \$7.89. John Earley, 123 N. W. 76th St., Miami, Fla.

**STIK** Tite sole protectors. Guaranteed to outwear shoes. Wonder Products Company, 3535 Avalon, Los Angeles, Calif.

**SUCCEED** With your own products. Make-sell them yourself. Formulas, processes, trade-secrets. Analytical service. Catalog free. H. Thady Company, Washington, D. C.

**QUICK.** Steady money introducing "Lead-a" Hand cleaner. New. Different. Removes grease, oil, stains; even printer's ink. Dandy to demonstrate. Over 100% profit. Constant repeater. Unique, self-selling plan builds business quickly. Details and sample free. No-San Laboratory, 4612 St. Clair, Dept. L-35, Cleveland, O.

**LAUGH** At unemployment. Earn money home propositions. No canvassing. Hetzel, 802 Garden, Hartford, Conn.

**AGENTS—**Enormous profits selling new low priced gas saver, also hot water heater "Booster." Wallace, 2606 No. Hamlin, Chicago.

**AGENTS** Looking for a holiday special. Prairie State Specialty, 1822 Newport, Chicago.

**IT'S** New! Washes clothes colorfastly clean without rubbing. Every woman buys. 200% profit. Details 25c. Big repeater. Sample free. Atlas, Chesterfield Station, Dept. M-26, Chicago.

**GOOD** Fountain pens, 13c up, samples 1 styles \$1. Bell, Desk B, Gaylord, Minn.

**AGENTS.** Earn big money selling our resurrection plants. Samples 25c postage. Desert Plant Co., Station A, Box 95, El Paso, Texas.

**MAKE** Your own products. Employ agents yourself. Toilet articles, soap, extracts. We furnish everything. Valuable book free. National Scientific Laboratories, 1950W Broad, Richmond, Va.

**300% PROFIT** Selling mystery gas lighter. Details 25c. Costs you \$1.00 each. Sample 10c. Square Deal Mfg., Desk PM-26, Bradford, Pa.

**NEW.** Profitable—Self auto step units. Quality rubber with owner's name molded white. Details free. Ebonite Products, Dept. M-40, 895 Main, Akron, Ohio.

**SELL** More goods! Engrave customer's signature or initials in gold on articles you sell. Free sample. Ideal, 480 Fifth Avenue, New York.

**500% PROFITS** Gold and colored sign letters for windows, offices, trucks, signs. Monograms. Easily applied. Permanent business. Nemite, Akron, Ohio.

**START 1933 Right!** Free valuable formula information for making best selling specialties. All lines. 300-750% more profit. See my advertisements—Business Opportunities—Formulas columns. Miller, Chemist, 1506AE, Tampa, Florida.

**REPLATE** Brass worn-off bath fixtures, reflectors, spigots, faucets, etc., with pure silver. U-Kan-Plate polish. \$1.80 ounce bottle. Satisfaction guaranteed. Agents wanted. Dept. A, U-Kan-Plate Company, Philadelphia.

**BUY** Old auto inner tubes at one-half cost a pound and resell them at 80 cents a pound. Formula \$1.00. Mitchell Ames, Effingham, Illinois.

**100% PROFIT** In the Everlasting Match. No flint or friction. What makes it light? No wind can blow it out. Details 50c. Sample and sales plan 25c. New Method Co., Desk PM-12, Bradford, Pa.

**PENNY** Each. Any size! Beautiful non-tarnishable gold window sign letters. New 6x9 catalogue. Amazing beautiful samples. Valuable working equipment free. Hard-breaking offer. Atlas Sign Works, 7941 S. Halsted, Chicago.

**FREE** Catalogue new needle books, hostery members, self-threading needles; cost 1c up; world's fastest 25c seller. Patsy Needle Company, Somerville, Mass.

**RAINCOATS.** Men, women, children, \$3.95. Quilt free. Goodyear Rainwear, 18 West 22nd, New York City.

**CHRISTMAS** Cards—Big values. 25 with name \$1.50. Box assortments 150% profit. Free offer. Graphical Printers, 5342 North Ave., Chicago.

**MAKE-Sell** your own products. Formula catalogue free. "Kenton," 32, Parkridge, Illinois.

**AGENTS** For Handlick: Powdered hand-soap. Approved Good Housekeeping. Everybody a customer. Fine opportunity. Sample free. Solar Products, J-2144 So. Troy, Chicago.

**MEN, Women—**Sell new 10c steel wool brush. Sells itself. Big repeater. Money maker for distributors. Skourpak Corp., 1161 East 106th St., N. Y.

**MYSTERIOUS** Liquid: Solders, repairs, metal, wood, glass, without heat. Whirlwind seller. 150% profit. Restover, 4317P34 Irving Park, Chicago.

**BIG** Money steady. High grade coveralls, slacks, pants, shirts. Advertising on back. Fast sellers. Great demand. Prospects everywhere. Free outfit. Strong Mfg. Company, 211 West Jackson, Chicago.

**SURE** Fire Christmas seller! Every woman buys. \$19 a day easy. Write—get a real surprise. Mission Factory, P. 2328 Pico, Los Angeles.

**BIG** Profits taking orders, shirts, ties, underwear, dresses, hostery, raincoats, sweaters, leathersuits, coveralls, pants. Outfit free! Nimsed Co., Dept. S, 4922-23 Lincoln Ave., Chicago.

**YOU** Are wanted to sell silver mirrors at home. Profitable business plating auto parts, tableware, etc. Write Sprinkle, Plater, 123, Marion, Ind.

**POLMET** Polishing cloth removes tarnish from all metals without the use of liquid, paste or powder. Our agents say it sells like "hot cakes." Details 25c; sample free. Gale & Co., Inc., 15 Edinboro St., Boston, Massachusetts.

**AGENTS:** Stamping names on pocket-key protectors. Sample check with your name, address, 25c. Stamping outfits. Emblem checks, check-fobs, name plates. Hart Mfg. Co., 303 Degraw St., Brooklyn, N. Y.

**GENUINE** Gold letters for store windows. Easily applied. Free samples. Liberal offer to general agents. Metalite Letter Co., 438-B North Clark, Chicago.

**WORK** At home, easy handwork; pays well. Sun-Co, Box 375, Brockton, Mass.

**FAST** Mail seller—Free sample. Plans. Circulars furnished. Seewagon, 2328 West Pico, Los Angeles, Calif.

**BIG** Money applying gold initials on automobiles. Easiest thing today. No experience needed. \$1.45 profit every \$1.50 job. Free sample. "Alako," X-1043 Washington, Boston, Mass.

**PROFITABLE** Home business. Legitimate. No canvassing. Maywood Publishers, P-923 Broadway, New York.

**NEW** Discoveries. Washes clothes without rubbing. Whirlwind seller. Great repeater. Splendid profit. Samples free. Bisco, 4316P Irving Park, Chicago.

**FREE** "Booklet of money making opportunities," new ideas, original plans, money making secrets and other valuable information. None require peddling or outfit. Ellis Co., 214 Grand St., New York.

**MAKE** Your own products. Employ agents yourself. Toilet articles, soap, extracts. We furnish everything. Valuable book free. National Scientific Laboratories, 1950W Broad, Richmond, Va.

**A BUSINESS** Of your own—Making sparkling glass name and number plates, checkerboard signs. Big book and sample free. E. Palmer, 512, Waver, Ohio.

**AGENTS—**Clever! Invention! Inkspoon makes every pen a fountain pen. Fast office seller; big profit, bound increasing everywhere. Exclusive territory offered. Sample free. H. Marol Company, Tribune Bldg., New York, N. Y.

**MAN** In each town to plate auto parts, reflectors, bathroom fixtures, refinish beds, mirrors, chandeliers; by new method. No capital or experience required. Simple plan of manufacturing at home starts you in big money-making business. Outfit furnished. Free particulars and proofs. Gun Metal Co., Ave. H, Derstun, Ill.

**AGENTS** Everywhere making money with our line of kitchen specialties, demanded in all homes. Big earnings possible. Write today for details. P. Seed Filter Co., 233 Broadway, New York.

**BIG** Money and fast sales. Every owner buys gold initials for his auto. You charge \$1.50; make \$1.45. Ten orders daily easy. Write for particulars and free samples. American Monogram Co., Dept. 40, East Orange, N. J.

**AGENTS—**Opportunity to make money; book containing 87 successful business plans; home or office; send for free introductory booklet. Ellis Co., 214 Grand St., New York.

**SOMETHING** The housewives want. A signed guarantee to save money and time in cooking. No competition. 400% profit. No license required. Station C, Box 23E, San Diego, Calif.

**PLAYBOY** Extracts—Bottle yourself! Labels furnished. 600% profit! Whirlwind money-maker! Repeater! Free offer. Thomas Manufacturing Company, Indianapolis, Ind.

**SELL** Men's neckwear—wonderful presentation. Astor 31, 38 East 23th, N. Y.

**\$10 DAILY** Selling 21 assorted Christmas cards \$1; sample box 35c prepaid. Sunshine Card Co., 229 Broadway, New York.

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**10,000 MONEY-MAKING** Formulas. Tell you how to make and sell almost everything under the sun: cosmetics, mucklugs, anti-freeze solutions, battery solutions, lever-ages, cheese, chewing gum, cleaning preparations, extracts, hair preparations, inks, bluing, leather polish, mirrors, perfumes, polishes, typewriter ribbons, carbon paper, washing powders, liquid soap, and hundreds of other profitable articles. Send no money. Just write a postal for "Hendley's 20th Century Book of Formulas." Pay postman postage and 1c. Popular Mechanics Press, 200 E. Ontario St., Room 802, Chicago.

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**DON'T** Be a job hunter—start your own business on our capital; no hard times, no lay-offs, always your own boss; hundreds average \$5,000 annual sales year after year; we supply stocks, equipment on credit, some 250 home necessities; selling experience unnecessary; wonderful opportunity to own pleasant, dignified profitable business backed by \$17,000,000 world-wide industry; for complete information write W. T. Rawleigh Co., L-U-PPM, Prescott, Ill.



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**U. S. PATENT** (Pending, serial 631,387) for sale. G. Stude, P. O. Box 1975, Victoria, B. C., Canada.

**SIMPLIFYING** Device for dial shoes. Magnifies and holds dial. Patent for sale. A. G. Bradford, 293 No. Almont Dr., Rossmore Hills, Calif.

**OUTRIGHT** Newly patented "Turn-in-one-chisel." Stanley Pentoski, 324 W. 29th St., New York, N. Y.

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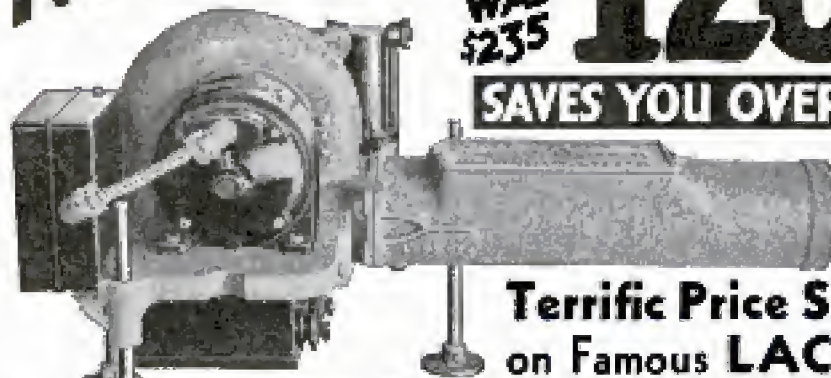
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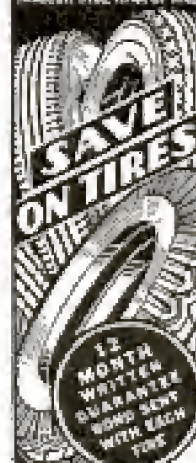
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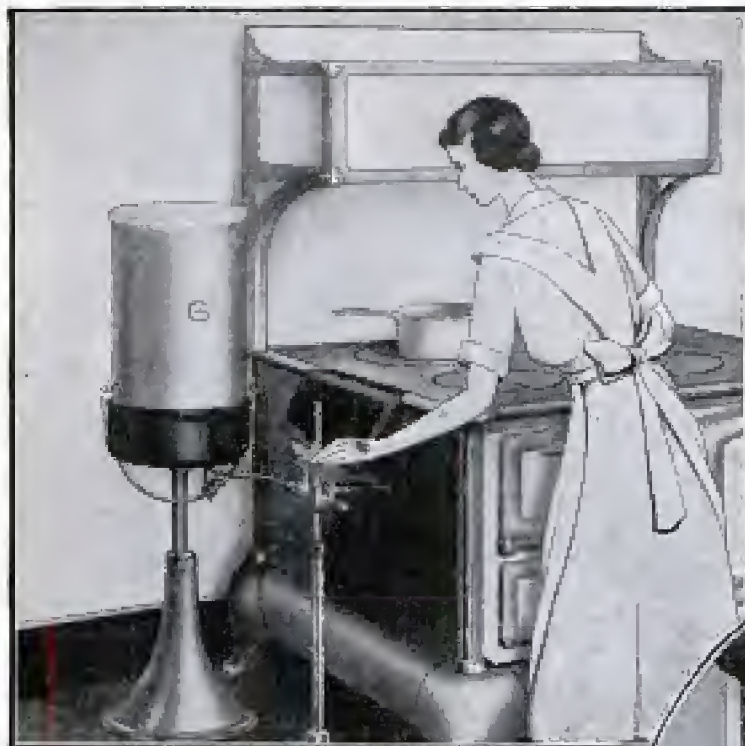
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## CHEAPER Heat Without COAL



Burning oil in stoves is a far cheaper method of cooking, baking and heating. Here's proof that people spend money to save money: During 1930 they purchased 76,096 oil burners for stoves and ranges and the demand grew so rapidly that in 1931 over 148,000 money saving oil burners were installed in stoves—an increase during depression times of 94.7 per cent!

**BURNS 96% AIR**  
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"Tegodsheta seller!" says Raymond Seael

Here's a remarkable oil burner of an entirely new "blue flame" type which gives twice the heat in your present stove or range — and costs less than coal! Simply sets in the fire box of any cook stove, range, heating stove or parlor circulator. Silently turns cheap oil into quick fire, much hotter than coal — and cheaper.

### JUST TURN A VALVE AND COOK

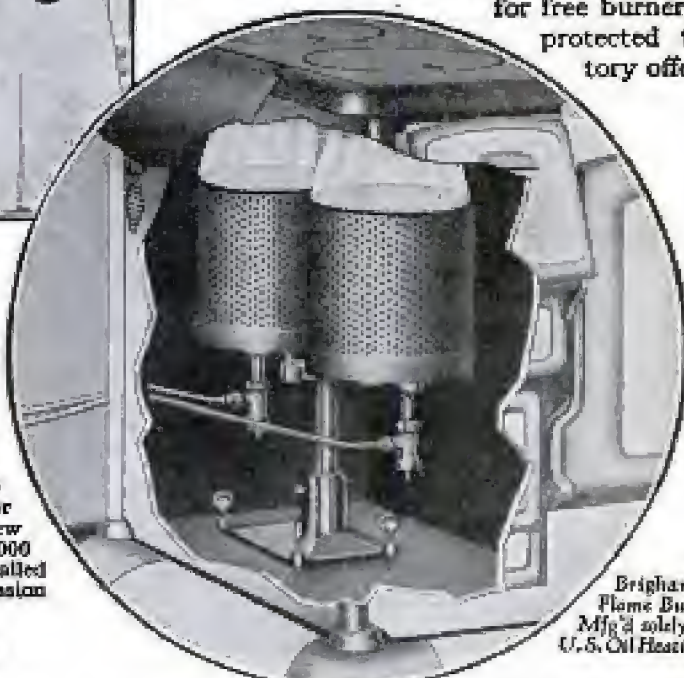
This amazing invention operates by a simple turn of a valve. Cooks, bakes, and heats with uniform heat. Starts instantly with a match. Burns, without waste, 96% air and 4% cheap oil. Most economical burner to install and operate. No smoke, soot, or odor. Absolutely safe. No gas or electricity necessary. Easily installed in few minutes by anyone without damage to stove. Guaranteed 10 years. Sold on absolute money-back guarantee. Gives universal satisfaction.

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Low introductory price and 30 day trial offer to first users in each locality. Write for free pamphlet on oil heating.

### SPARE-TIME WORKERS WANTED

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Brigham Blue Flame Burners. Mfg'd solely by the U.S. Oil Heating Co.

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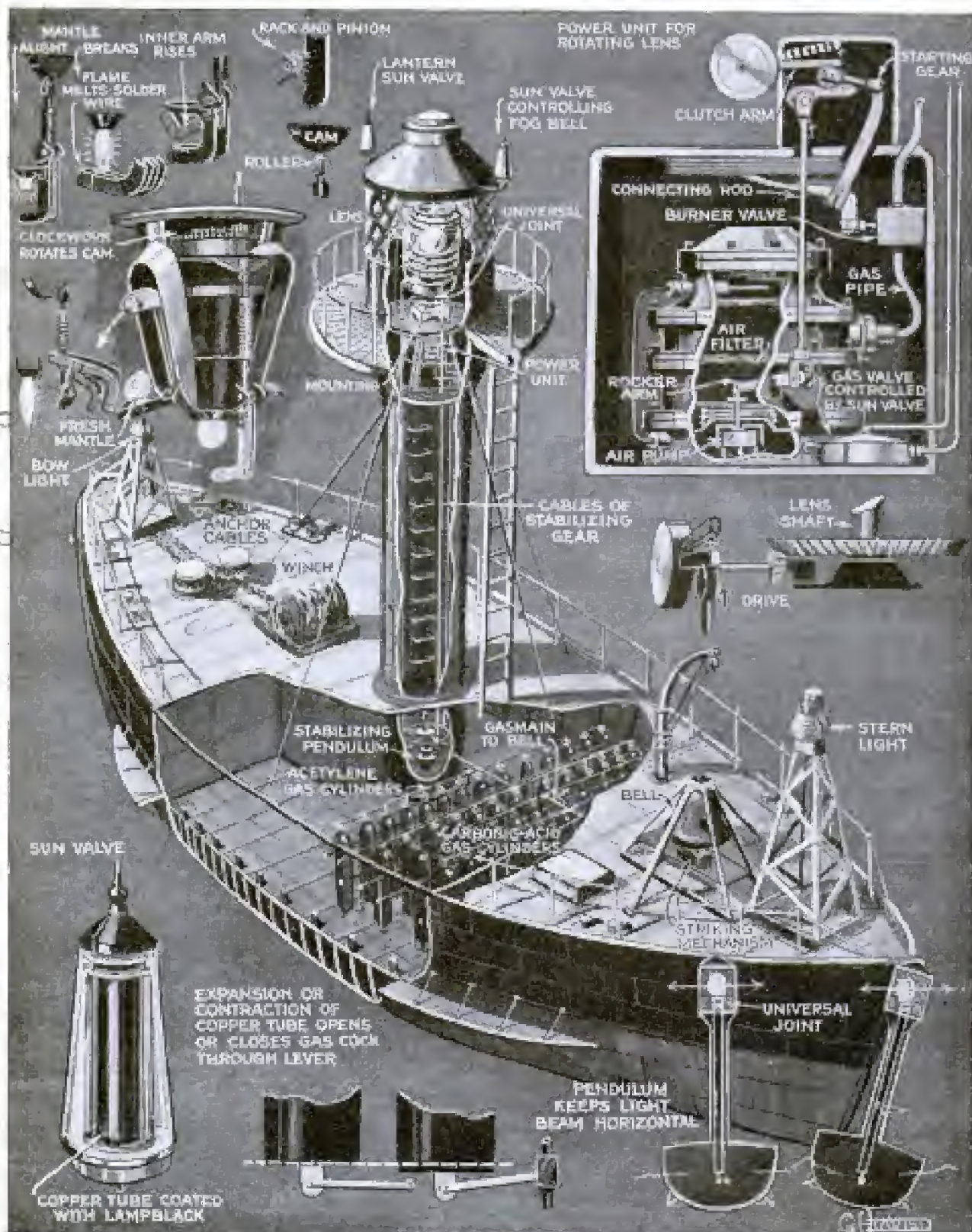
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fog bells in murky weather and darkness and even replaces broken gas mantles in the 40,000-candlepower light. Carbonic-acid gas stored in the hull runs this mechanism and acetylene gas is the illuminating medium.



# Popular Mechanics Magazine

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Vol. 58

DECEMBER, 1932

No. 6



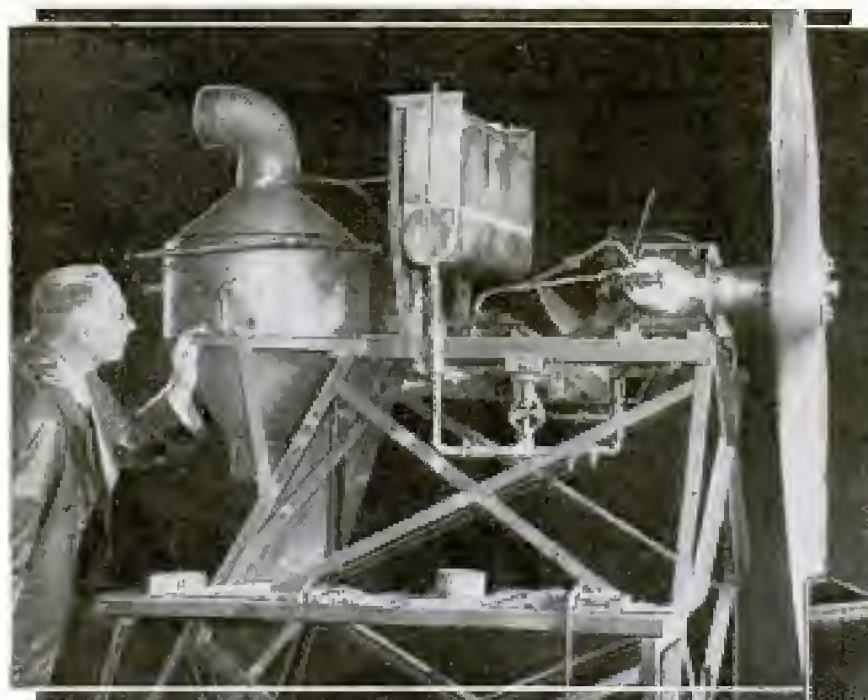
A STEAM power plant of unusual design will be used to drive a small airplane in a one-stop flight from Akron, Ohio, to Los Angeles. The engine, invented by Harold C. Johnston, has been given several hundred hours of testing. The plane in which the steam plant is being installed has been in service for two years, equipped with a sixty-five-horsepower radial engine.

The new steam plant consists of three main units—the oil-heated boiler, the two-cylinder engine and a condenser. The boiler weighs but sixty-five pounds and consists of a sheet-metal shell lined with coiled stainless-steel tubing. At the bottom is a burner using light furnace oil. Steam pressure can be built up to the required 1,600-pound point in about two

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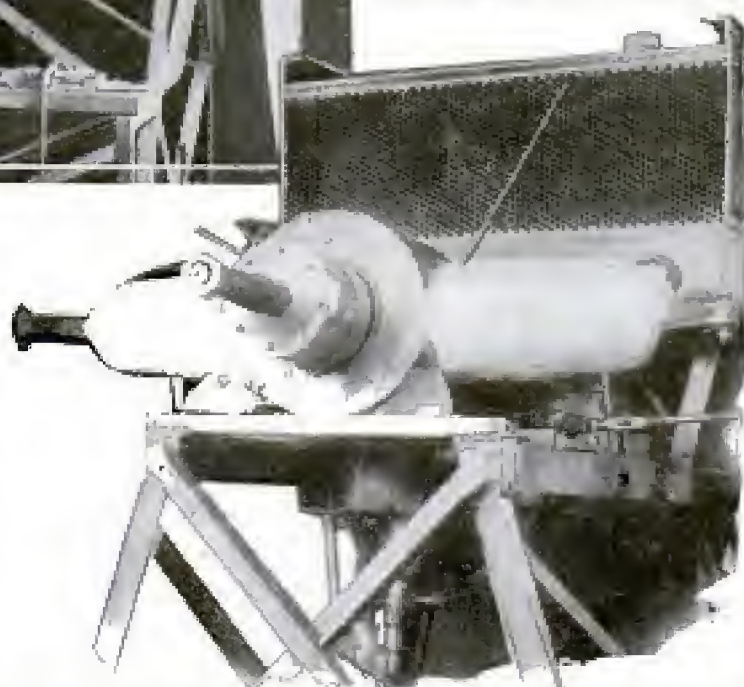
ute, so that the propeller speed can be kept down to the most efficient rate, with a probable reduction in propeller noise. It can be operated for days without stopping. Weight of the ninety-horsepower plant is 152 pounds. This gives a weight-per-horsepower of about 1.7 pounds.

In test-block operation, the steam engine produced only two noises of

minutes. Failure of the boiler would mean only the bursting of a steel tube so small that no damage would be done.

From the boiler the vapor passes into the cylinders through poppet valves similar to those used in gasoline engines. The engine of the power plant that is being installed in the plane develops ninety horsepower at the stated pressure. After steam has passed through the engine cylinders, it is liquefied in a condenser resembling a honeycomb-type automobile radiator. The water is then fed back into the boiler. One of the outstanding advantages claimed for steam plants, and borne out by tests with the new unit, is the greatly reduced operating cost as compared with a gasoline unit. A sixty-five-horsepower gasoline engine, using high-quality fuel at 30 cents a gallon and lubricating oil at \$1.35 a gallon, can be operated for an hour at a cost of about \$18, this estimate including depreciation, but not pilot's salary or other costs. The gasoline motor can be said to have a useful life of about 1,000 hours. It must operate at fairly high speed.

On the other hand, it has been found that the ninety-horsepower steam engine can be run at a cost of \$1.68 per hour. It delivers its maximum power at speeds between 900 and 1,400 revolutions per min-



Top, Power Plant on Test Stand; Below, Engine, Not Much Larger than Motorcycle's, Which Produces Ninety Horsepower

noticeable intensity—the swishing of the propeller through the air and a clicking sound resulting from the operation of a valve cam.

## ELECTRIC EYE "CANDLES" EGGS 99.3 FASTER THAN EXPERTS

Through adaptation of the "electric eye," or the photo-electric cell, an egg-candling machine has been developed which passes judgment more rapidly and accurately and with less breakage than the most expert human. It can classify as many as a hundred varying grades, and in competition with an experienced candler, passed several eggs which he had rejected as bad. When broken, however, the rejected eggs were found to be good.

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# FISH-SCALE ESSENCE YIELDS BIG PROFIT

B1780

Big profits are returned to fishermen and manufacturers by extraction of essence from fish scales. In 1928, a gross income of \$134,000 was received by fishermen for 2,344,000 pounds of fish scales, and the industry is growing. The manufacturers reap their profits from products in which this extract is essential. When incorporated properly with celluloid plastics, fish-scale essence produces finishes which have a luster like mother-of-pearl. Celluloid articles, inexpensive jewelry and metal ornaments are lacquered with such finishes. The essence also is being developed for decorative purposes, in interiors and exteriors and on the body work of automobiles, leather goods and furniture. Most of the essence produced in the United States comes from the river herring, the sea herring of the Atlantic and the California pilchard. The essence is made from the silvery substance deposited in the skin of the fish. When rubbed off the scales, freed of foreign matter and suspended in a suitable liquid, this substance constitutes pearl essence.

## PROTECTING GRILLE ROLLS UP LIKE WINDOW SHADE

B1747

Admitting light and air, yet impassable to trespassers, an all-metal grille operates on the principle of a window shade. Adapted to store windows, it permits the display of merchandise to be visible from the street, yet affords protection against "smash-and-grab" bandits. In homes, the grille allows full ventilation and, when in use, may be rolled up completely out of sight.



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Five Different Maneuvers Are Executed by This Electric Toy Truck Controlled by Push Button



## ROBOT TOY OBEYS COMMANDS AT TOUCH OF FINGER

Five human commands are obeyed by a toy electric dump truck to which a transformer and fifteen-foot cord are attached. Pressing a button on the transformer once, causes the wheels to swing slowly from side to side. When they are in the desired position, a second tap causes the vehicle to move forward, a third reverses the direction and a fourth tap on the button causes the truck to dump its load, while a fifth brings it back to neutral. Rapid taps bring different and desired action. In this way the truck can haul twelve pounds of sand, for example, back it up, dump it, straighten out and return for another load at the will of the operator.

B1782

## VOICES OF DEAD IN FILMS

Preserved on a phonograph record, the voice of the late President Woodrow Wilson will be used in a talking picture featuring leaders of the World War. The original record will be made a part of the sound track of the film.

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Chicago

East Moline, Ill.

Wm. Co.

Buddy

Well Iron Works, Inc.  
34th St. (Marine)  
Long Island City  
N.Y.



031706  
860

Plane Pilot -  
C.C. (Boots) L. Bontillier  
POPULAR MECHANICS

Stunt Man in Act of Dropping from Wing of Plane to Top of Speeding Auto; Note Unusual Device for Landing



Lake  
Calif  
J. H. Pate  
at mirror very

Sub

# STUNT MAN HOPS FROM PLANE TO TOP OF SPEEDING AUTO

To prove that, in an emergency, a human being could be transferred from an airplane in flight to a speeding automobile, a movie-stunt man recently made the transfer. He dropped from the wing of the ship, flying a few feet above the ground, to the top of an automobile fitted with a frame above the top to receive him, and landed right side up without injury.

## AUTOMATIC STEERER FOR BOAT RELIEVES THE HELMSMAN

Following a course set on the compass in a straight line, an automatic steering device relieves the helmsman or operator of yacht or motorboat. The compass acts as the brain and the device as the hand that turns the steering wheel. Only a look-out must be maintained to avoid collision with other vessels, driftwood and floating objects. The operator is left free to consult his chart, plot future courses, attend to the engine or do other work. He need give only slight attention to the steering, as this is being done more precisely than if he were devoting his entire time to the wheel. A change in course to pass around another boat requires no more effort than

031754

Automatic Compass Corp  
11 W. 42 nd  
New York

to turn the compass head slightly. It is even possible to guide the boat by remote control by means of an extension cable to some other part of the craft.

## CARD-TABLE LAMP HAS ASH AND GLASS TRAYS

Designed for the players' convenience, a new lamp bracket for the bridge table is provided with a tray large enough for two glasses, an ash receiver, and match and pencil holders. The bracket, attached to two opposite corners of the table, holds two lamps placed at a height that causes no eyestrain. Use of twenty-five-watt inside-frosted bulbs is recommended, because of economical operation. When the lamps are removed, with their stands, from the bracket, the bridge table may be folded. Installation of the lamps requires only a minute. Special shipping cartons in which the lamps are packed may be used for storing them.

Sheldrake 8/00



Trays on These Bridge-Table Lamps Provide Re- Matches, Glasses, Pencils and Ashes

Gerry H. Weber  
Vickridge  
Co. Inc.  
Albany

Are  
your  
lamps  
205  
Sheldrake

and material



# Motor Center Circled by Covered Roadways



Cont. H. J. Williams & Co. Colchester  
29. Ocean Road. Derby Heath  
W. London England

Refer to Industrial Development Board  
Confederation Life Bldg. Winnipeg  
at 10 p.m. 10/11/38

Auto-Parking Station in London Will Have Roadways around the Sides, as Shown; the Roads Are Built for Spring and Hill-Climbing Tests; Space for 5,500 Cars Will Be Provided

Every floor of a motor center proposed in London, will be accessible to motor cars by means of a series of covered roadways twenty feet wide connected by ramps. Facing the elevated highways will be automobile showrooms totaling one mile of frontage, while inside there will be space for approximately 5,000 parked cars. Portions of the road will serve as proving ground for hill-climbing ability and riding comfort. On the roof, it is planned to construct an airplane landing field.

## BERRY COCKTAIL FOR HEALTH IS NOW PRESCRIBED

Recommended as a before-breakfast beverage as well as basis for jellies and preserves, the wild mossberry of northern Manitoba, Canada, now is rising from obscurity to popularity. This bush fruit resembles a cranberry but is said to be

richer in flavor. Frost seems to sweeten its flavor and freezing does not hurt it.

## PLANTING TOOL HOLDS DIRT LEAVES CLEAN HOLE

Florists and gardeners may save time and labor in the planting of bulbs or transplanting of seedlings by using a tool which bores a clean hole. When the tool is driven into the ground to the desired depth, squeezing the handle contracts the blades which grip the earth, and upon withdrawal,



leave a round hole with little tendency toward falling walls.

031752  
608 Harbour Commission  
Bldg. Toronto-2. Can.

031692  
J. W. Henry & Co. Erie  
Collinsville, right side material  
(will be on market)





These Formidable-Looking German Tanks Are Protected by Cardboard Only: Excellent for Peace-Time Tactics but Useless in War

clut

### TANKS "ARMORED" WITH PAPER USED BY GERMAN ARMY

Armored cars protected by "armor" in appearance only were used in the autumn maneuvers of the German army for want of something more effective. The treaty of Versailles limits the type of armament Germany can possess, and as a result the tanks were nothing more than cars covered with cardboard which would be of little use in actual warfare.

### PESTS REMOVED FROM CATTLE BY VACUUM CLEANER

Removal of the ox warble and other parasites from cattle is made easy by a device employing the principle of the vacuum cleaner. The pest remover is built on

an automobile trailer. In operation, the nozzle is placed over the pest on the animal's back, and air suction does the rest. A gasoline engine supplies power. Several lines of hose are connected to the device so that as many animals may be treated at the same time.

### ASPHALT COAT SEALS PILING AGAINST SEA WATER

Impregnating concrete piling with an asphalt coating makes the concrete impervious to the action of sea water and permanently protects the steel reinforcement from rust and corrosion. Piles to be treated are first heated and subjected to a vacuum in order to remove existing moisture from the pores. Then liquid asphalt is applied at high temperature under pressure. The treatment thoroughly fills the pores of the concrete and covers the piling with a coat to the depth of about one-half inch. Tests have proved that even if the treated concrete is chipped by accident, the asphalt seal is effective enough to prevent entrance of moisture.



Vacuum-Cleaning of Cattle Has Been Adopted as Effective Means of Removing Pests; Several Operators Are Supplied Power by Portable Motor

Comt. Allen P Child  
Box 4673, Kansas City  
Mo.

Pan Pacific  
Piling & Construction  
Co. Los Angeles, Calif



Hide and Leather Ltd. 31714.

Dept. of Commerce

POPULAR MECHANICS

Washington D.C.

## SKIN OF FROGS AND KANGAROOS MADE INTO LEATHER

In the search for leather for novelty goods, tanners are using not only the skins of many animals, but of fishes, reptiles and even birds. Included in the list are monkeys, frogs, snakes, kangaroos, crocodiles, alligators and ostriches. Skins of sharks, rays and seals are made into footwear, traveling bags, brief cases and novelty articles. Kangaroo and wallaby skins are used where a specially durable leather is required, while alligator and crocodile skins, long used in making luggage, now are employed by the shoe and pocketbook manufacturers. Shoes and pocketbooks are made of snake skin, trimmings for leather goods are made of the larger frog skins and ostrich skins are made into novelties of various kinds, while monkey skins have been used in a similar manner. By embossing methods, American tanners have been successful in imitating the grains of these skins.

## ANGEL FISH LIVE ONE MONTH IN AQUARIUM PRISON

French angel fish, one of the most beautiful of deep-sea species and widely sought



Here Is an Angel Fish, a Deep-Sea Specimen That Survives Only Thirty Days in an Aquarium

for aquariums, can live but a month in captivity. Found in profusion just outside Morro castle, off Havana, they are one of the principal attractions of the Havana aquariums but, being so short-lived, must be constantly replaced.



This Group of Students Received Only \$37.80 for \$50 in Experimental Play at a Slot Machine

## SLOT MACHINES PAY JACKPOTS ONCE IN THOUSAND TIMES

Chances of winning the jackpot by playing the ordinary slot machine found in stores and restaurants are about one in a thousand. This was the conclusion of students of New York University who took apart a typical machine and figured the chances of winning. They also found that \$50 invested in a slot machine set to pay in the customary manner would return no more than \$37.80.

## SECRET OF "STONE DOUGHNUTS" IS FOUND IN NATURE

Oklahoma's "stone doughnuts" were formed by nature and not by Indians. These wheels of red sandstone, as large as dinner plates and with holes in the center, occur in considerable numbers near Geary. Samples of the stone rings recently were examined by a mineralogist for the Smithsonian Institution who determined that they were natural formations and owed their origin to sand deposited by whirling gusts of wind. The sand piled up, layer upon layer, and in time the grains were cemented together and compressed into sandstone masses. Then, weathering broke down the stone which tended to fall apart into circular layers, and wind-blown sand finished the product by wearing holes in the center. While the Indians did not make the rings, it is believed they placed some of them in piles to make altars of them.

Dr. Truman Nicholson  
and Dr. W. F. Dishag

Class in General Science  
under Dr. E. E. Green

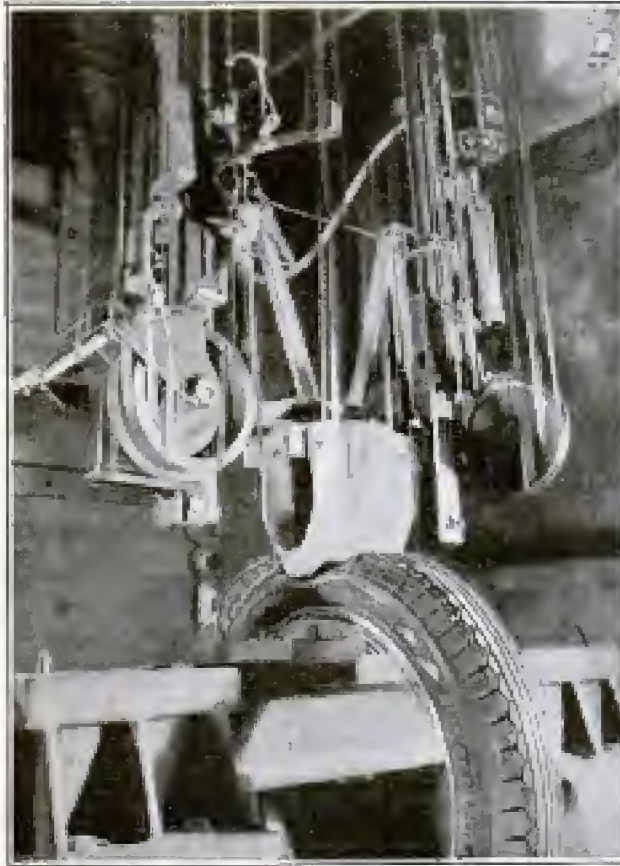
Source of 2732

Washington D.C.



B147 3 Cml. Walter E. Burton  
1032 Florida Ave  
Akron Ohio

# *when* Death Rides



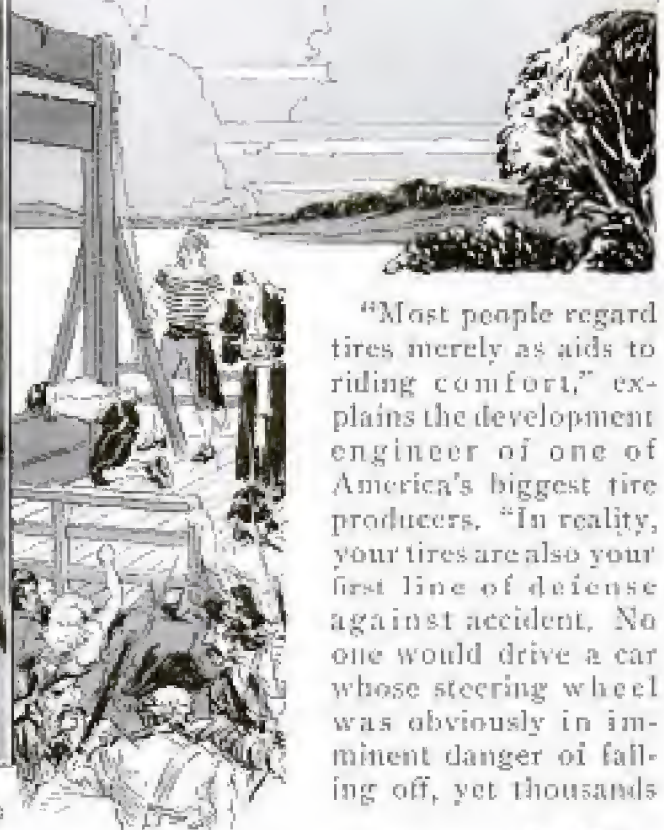
"Guillotine Test"; a Sharp Plunger Dropped on a Tire Determines Carcass Strength

By MORGAN W. GIBNEY

**A**RE you riding on rubber that makes your car a death trap?

A recent survey indicates that one car out of ten is being operated with one or more "shoes" which are unsafe—more than 2,000,000 cars traveling the highways of the nation which are a threat to their drivers and to other motorists.

The old adage, "a car is no safer than its tires," is especially true today. Speeds have mounted by leaps and bounds during the past few years. Nowadays even the cheapest cars can attain seventy miles per hour—and do. Mere mile-a-minute speed is no longer a thrill. Yet at sixty your car has the same capacity for inflicting damage as though it were diving off a ten-story building.



"Most people regard tires merely as aids to riding comfort," explains the development engineer of one of America's biggest tire producers. "In reality, your tires are also your first line of defense against accident. No one would drive a car whose steering wheel was obviously in imminent danger of falling off, yet thousands



A "Bald-Headed" Tire, on Which the Center Tread Is Worn Off, Promotes Skidding





of motorists drive cars with front tires which are on the verge of blowout. After all, you really have three steering wheels; the wheel you hold in your hands and the two front wheels. If any one of them fails, you're in trouble—plenty of trouble.

"You may have the best brakes in the world, but brakes can only stop the wheels. It's up to the tires to stop the car. Your car rides on four points of contact, and your control over your car is no better than its road grip at those points.

"Shock-proof bodies and shatter-proof glass help to protect you after the accident, but good tires protect you by preventing accident. You may have low center of gravity and perfect balance in your automobile, but when you're rounding a turn on 'slick' wet pavement; it's up to the tires to grip the road and keep the car from skidding."

Some motorists drive their tires too far, through sheer neglect; others, because of false notions of economy. At Akron, the capital of the world, they will show you that the average modern tire costs about





B1473  
866



Tire Injuries Are Not Always Apparent: This Casing Seems Good for Many More Miles, but When Torn Down, Reveals Serious Carcass Injuries

50 cents per 1,000 miles of safe operation. Driven beyond their limit of safety obviously becomes rather expensive

One puncture eats up the energy represented by driving 1,000 miles at constant danger. Should a tire be discarded? How much is safe mileage? That depends on your driving, say the experts. Tire life depends not so much on number of miles as the kind of driving.

For example, your tires wear out as rapidly as at 14,000 safe miles if you drive out after driving on a bed-stone road at a high temperature,

could drive it at a constant temperature of ninety degrees, your tires would last about twice as long as those driven in a constant

temperature of ninety degrees. If you underinflate or overinflate your tires, you shorten their life amazingly. If you like to step out at the traffic light with a burst of power, your tires pay for that thrill. And, of course, if you like to stand the old bus up on its nose when you put on the brakes, that costs miles too.

Let the tire itself tell you when it should be removed from active service, is the advice of those who know their tires. When the anti-skid tread is worn off, get rid of it. Don't wait for the rubber to wear down to the "breaker strip." When the tread is gone, most of the traction has gone with it. With the tread goes sixty per cent of the tire's resistance to bruising. However, if you have given the tire normal wear, the carcass probably has lost at least half of its original strength. Consider the punishment that tire takes in carrying your two-ton car around, flexing 4,000 or 5,000 times every mile, absorbing the terrific road shocks of fast driving. A bald-headed tire is an old tire, a thin tire, and the only safe place for it is the junk heap.

In some states, busses and other public vehicles are regularly inspected and forced to replace tires which have worn smooth. Safety commissions have recommended



Cross Section of "Retreaded Tire" Turned Out by Slipshod Methods May Look Serviceable...



but, in This Case, Vulcanizing Was Improper and the Tread Easily Separates from Body



that motor cars operating on unsafe "shoes" be barred from the highways. The next time you are searing along the highway and see another hard-driven car approaching, imagine what would happen if, suddenly, it leaped in front of you at the instant of passing—and you'll have little difficulty in realizing why the poorly shod car is becoming an outlaw.

Beware the man who offers to make your old tire "as good as new." In most cases, retreading is a poor substitute for a new tire. Indeed, the retreaded casing frequently is less safe than it was before.

In the research laboratory, tire engineers can show you the flaws in this sort of economy.

"Here is an answer to a retread gyp's prayer," explains the engineer, rolling out a used tire. "Except for its worn tread, it looks perfectly sound, inside and out. You can't see any carcass breaks and bruises; to the average motorist, it looks as though a new tread should double its life. But, to anyone who knows tires, it's a different story."

With a few deft movements, he strips away a portion of the tread and exposes a dangerously weakened point in the cord fabric.

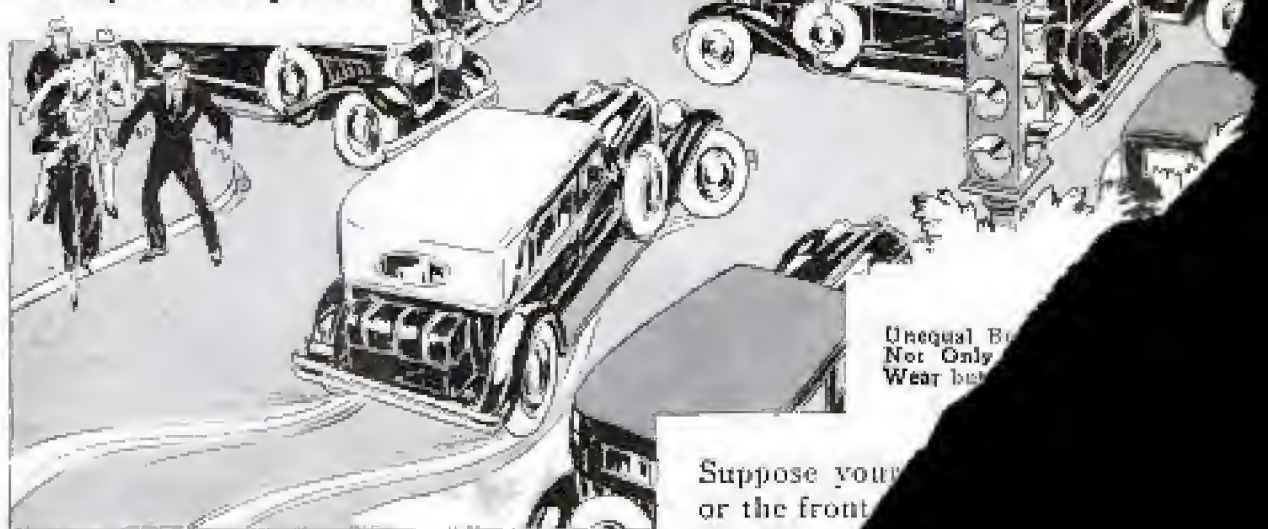
"Now, let some rule-of-thumb tire repairman slap a new tread over that weak spot. Then put the



Tires Worn Thin Are Very Susceptible to Puncture; This Casing Has Traveled 14,000 Miles



The Tread of a New Tire Is Heavy Enough to Withstand Tacks without Puncturing Tube



Unequal Wear  
Not Only  
Wear but

tire on a front wheel and hit a sharp bump at high speed—and see where you land.

"Under certain conditions, however, a retread is really advisable and economical.

Suppose your car has a worn rear tire or the front tire is flat. The tire is

few thousand miles old. It may be a good idea to retread it. It is probably the best way to get a new tire for a few dollars.



101 775  
868

Le miroir du monde  
9/24/32

# POPULAR MECHANICS



This Odd-Looking Building Is a Well. Although It Is All Above Ground; Condensation Pulls Water from the Air

## WELL LIKE GIGANTIC ANT HILL GATHERS WATER FROM AIR

Resembling a huge anthill, a tower has been erected in an arid section of southern France to become what has been termed an aerial water well. This section, which is devoted to horticulture, is almost rainless, but has hot days and cool nights and the air is well saturated with vapor. The tower is built with a number of slanting canals on the inside, some running upward from the lower rows of openings in the wall and others downward from the upper rows. The heated daylight air enters and rises through the former to the top where it is trapped in a central shaft. When the outside air is cooled at night, it sinks through the down-sloping canals to the central shaft, mingles with the trapped heated air there and forces out of the moisture, the result being collected in the shaft and used for irrigation. The tower is of a height of some 600 feet and 100 feet high. The walls are 10 feet thick and are of concrete. It is thirteen feet in diameter. It radiates from the inside during the day and during the night the aerial well gathers water per surface. In the high

a similar system built over 2,300 years ago, and if the present well proves satisfactory others are to be constructed in northern Africa where there are enormous losses of cattle through the lack of drinking water.

B1773

## SLOT MACHINE SELLS TOWELS ON CREDIT

Paper towels are dispensed by a penny vending machine which collects from the customer after he has used the article, instead of before. It was found that most

persons washed their hands first, then were forced to search through pockets with wet hands for a coin to obtain a towel from machines operated in the usual manner. So a towel dispenser was built on the theory that most people are honest, and contains a placard inviting the patron to use the towel first, and then hunt for



If Honesty Is Customer's Policy, This "Towel First, Then Pay" Device Will Make Money

the coin to insert in the slot in payment of the service.

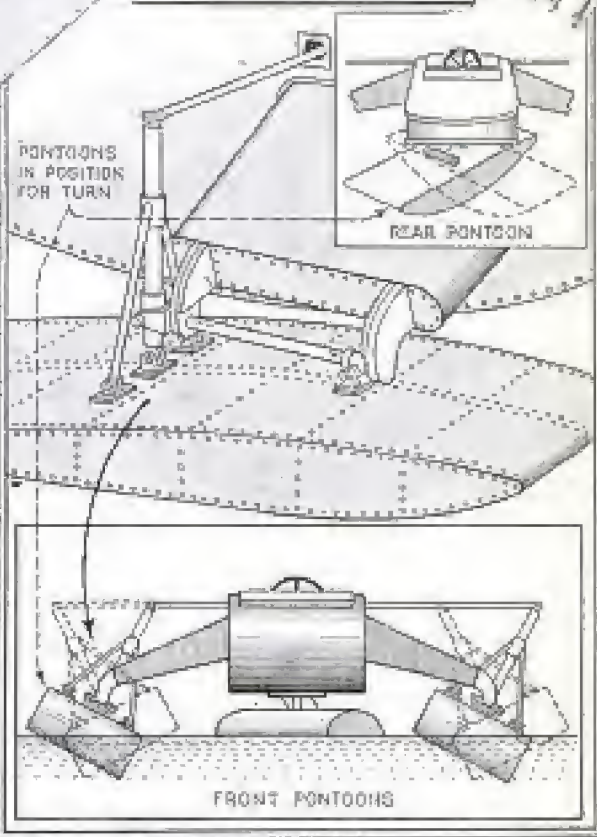
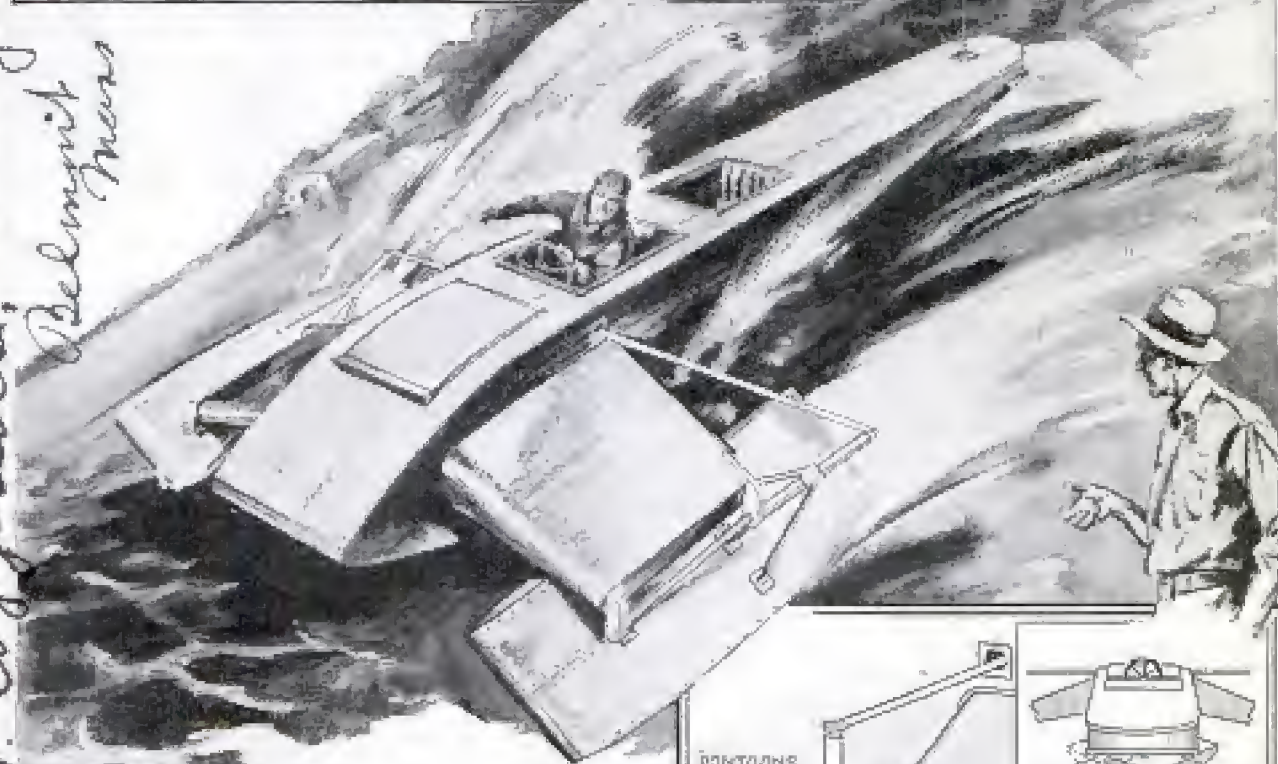
Paper Products Co.  
323 W. Randolph  
Chicago

France - en. Provence

old generally if cost \$2.50 or more. Towels are purchased from company.



# Floats Act as Balloon Tires on Racing Boat



Greater maneuverability, more speed from less power output and increased safety and riding comfort are promised in a "front-drive" speed boat suspended at three points on adjustable pontoons. In turning, a twist of the steering wheel tilts the two front pontoons, affording a banking action while the rear float pivots to act as a rudder. The outboard motor, mounted forward, pulls rather than pushes the craft and further increases steering response, enabling the boat to turn around practically within its own length. The body is connected with the pontoons through air-cylinder shock absorbers, giving, in effect, much the same suspension as a motor car on its wheels and contributing greatly to stability and riding comfort.



B/721

870

Standard Oil Company of New Jersey

J. J. Walker

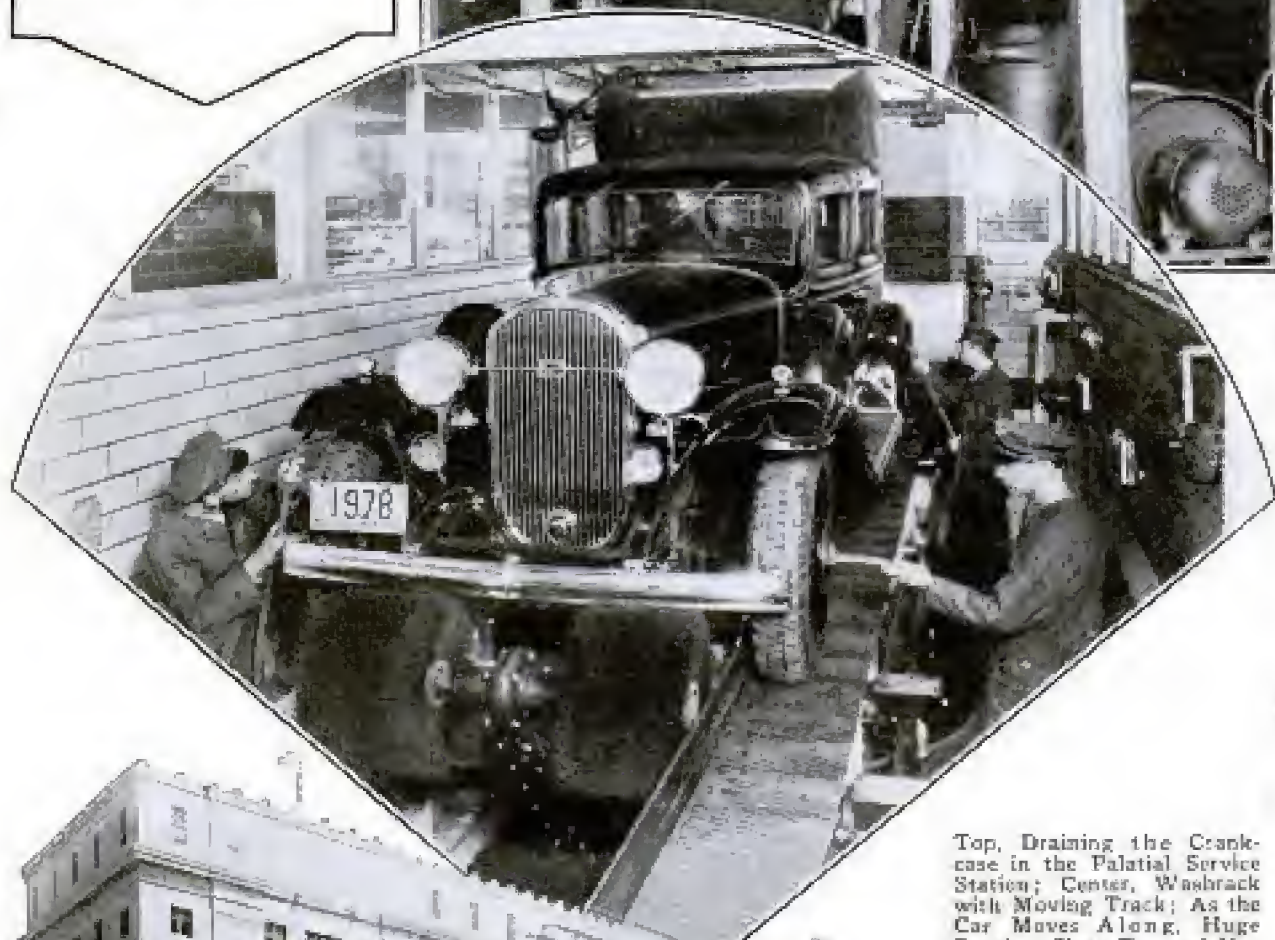
POPULAR MECHANICS

Washington D. C.

# Beauty and Efficiency Combined for Autoists

Constitution Avenue  
from 2nd to 3rd NW

SAID to be the world's largest and most luxurious automobile-service station, this "Servicenter" recently was opened in Washington, D. C., within a block of the nation's capital. Here, lowly flivver and aristocratic limousine get their "beauty treatments" in surroundings more suggestive of a pretentious hospital than a maintenance and repair shop for motor cars.



Top, Draining the Crankcase in the Palatial Service Station; Center, Washrack with Moving Track; As the Car Moves Along, Huge Brushes Clean Top and Underside; Below, General View of the "Servicenter," of Which the Service Station Occupies Top and Bottom Floors with Offices between Them





Mr. William L. Strong  
Archaeologist

B 1694

**HUMAN JAW OF THE ICE AGE FOUND IN NEBRASKA**

Cleveland Playhouse 329

Men probably dwelt in America at least 15,000 years ago. This conclusion has been reached by the Smithsonian Institution as the result of the finding of a fragment of bone from a human jaw in deposits of earth apparently laid down when the last of the great glaciers receded from the United States, some 15,000 to 30,000 years ago. The fragment, along with crude bone and flint implements and broken bones of animals, perhaps eaten by the hunter whose jaw was unearthed, was found on Signal Butte in western Nebraska. This butte was famous as a signaling station in the days of Indian wars. The jawbone was in the lowest of four separate layers of relics, showing human beings lived there in four periods ranging from ancient times down almost to the present. Relics in the lowest layer seem to date from shortly after the close of the last ice age.

Washington  
D.C.  
Indianaapolis  
and



Top, Young Woman Holding Bar Which Presents a Streak of Light across Front or Rear of Vehicle; Bottom, Bar on Truck Shows Its Width at Night



**TAIL-LIGHT BAR INDICATES FULL WIDTH OF CAR**

Resembling a brightly glowing neon tube, a tail-light bar now is available which extends the full width of the car or truck on which it is installed and is plainly visible through fog or the glare of approaching headlights. Illumination is obtained from two standard tail-light bulbs inclosed in a tubular bar, fifty-four to ninety inches in length according to the width of the vehicle. Through a new application of reflection and refraction, this light is transformed into a brilliant streak, visible at greater distance than any signal light now in use. If one bulb burns out, the other is sufficient to maintain adequate illumination. If both burn out, a reflector disk in the center of the bar warns following traffic. In addition to the red warning light for the rear end of trucks, a green light bar may be mounted on the front end to warn oncoming traffic.

**THREE RIDE THIS MOTORCYCLE WITH SIDECAR FOR TWO**

Members of the Spanish civic guard are patrolling the roads of that country on three-passenger motorcycles. The vehicles are equipped with sidecars holding two persons sitting back-to-back, thus enabling a cruising squad to cover all angles of the road, one armed guard facing the rear while the other watches the front.



This Police-Patrol Motorcycle Has Sidecar for Two with Seat Arrangement as Shown

Made in England

3242 Leeburner  
Washington, D.C.

329 W. Ohio St. Indianapolis  
Streck G. Lite Corp.  
(Mfr. Side Lamp Corp. (Eliv. General Motor) Anderson, Ind. Engin.)

More than 14,000,000 of the 29,904,000 families in the United States possessed their own homes when the last census was taken.

Bureau of Census, Washington, D.C.



B1759

Sound Communications Corp  
11 W. 42nd St. New York

872

# POPULAR MECHANICS

Harris Secretary  
Treasurer

George  
Am



Recording Device at Right Picks Up Conversation without Any Connection to Telephone Line; Record Can Be Played Immediately

## DISK LISTENS IN ON TELEPHONE AND RECORDS MESSAGES

Telephone messages can be picked up and recorded by a device that has no connection with the apparatus or wires of the telephone company. The record can be played back immediately. In a demonstration, Sidney Y. White used a rubber-wrapped air-core coil about the size of a baseball, placing it near a telephone box. Magnetic leakage from the telephone circuit was picked up by the coil and carried to a box of suitcase size which contained an amplifier and a recording device. The phone message, inscribed on an aluminum disk, can be reproduced immediately in earphones or through a loud speaker. Each side of a sixteen-inch disk takes down about twenty-five minutes of conversation. Mr. White also demonstrated a home set which would automatically take down three brief messages in the absence of someone to answer the telephone. The recording of programs direct from a radio receiver also is practical.

## GOLD FOUND IN SKINS OF BEARS BROUGHT FROM ALASKA

Alaskan grizzly bears stick to the gold standard, or rather, the gold sticks to them. When a University of Michigan forestry professor went prospecting in bear skins brought from the Yukon, looking for new types of animal parasites, he found the expected fleas, and also unexpected flakes of gold scattered throughout

the fur. The skins were purchased from Indian hunters at Whitehorse, in the Yukon, and brought to the university for study. In hunting for parasites, the fur was carefully combed and the dust was then "panned" in a small dish with water, much as gold is treated by prospectors.

By this operation, the professor was pleased to find many types of insects, but, on looking more closely, he also saw yellow flakes which recalled the days when he had prospected for minerals. Examined under the microscope, the flakes were found to be gold, but hunting for it would scarcely pay, as there is very little of it. How the bears collected the flakes is a mystery. They may have caught bits of the metal in their claws while walking in stream beds, later transferring it to their hides while scratching.

B1748

## BIRD BATH HAS FEEDING BOARD AROUND ITS EDGE

Serving a double purpose, an unusual bird bath made of concrete has a feeding board around the edge. The center is filled with water while the recess on the edge is for food.



Traylike Depression around Edge of Bird Bath Holds Food for Feathered Guests

B1763

Prof. Elmer V. Baxter,  
School of Forestry and  
Conservation

Built by Nelson Edwards  
111 W. Lexington St.  
Baltimore Md.

in backyard at 3054 Arundel Ave  
Baltimore

reprinted material



B1634

Quiner. James V. Lafferty

POPULAR MECHANICS

873

HOUSE BUILT LIKE ELEPHANT  
CONTAINS SIX ROOMS

Easily visible for a distance of eight miles, a six-room house shaped like a giant elephant attracts the attention of tourists at Margate City, N. J. The

Six-Room House Built to Resemble a Giant Elephant Carrying a Howdah; the Body Is Thirty-Eight Feet Long, and the Howdah Is Sixty-Five Feet above the Ground



Entire description are new  
1500 yards

structure represents "Jumbo" standing in a feeding position and contains six rooms furnished like a home. There are two spiral stairways, one in each hind leg, and the rooms are all on one level, occupying an area of eighteen feet square. On top is a howdah or observation tower, sixty-five feet above the ground. The body is thirty-eight feet long and eighty feet in circumference, the legs are twenty-two feet long, and the eyes, eighteen inches in diameter, are made of glass. The house contains twenty-two windows and 12,000 square feet of tin were required to cover the outside.

ly. If phosphorus is abundant, the liquid in the bottle turns dark blue. Varying degrees of phosphorus in the soil show up in colors from dark blue to colorless, the last revealing a soil equally bad for crops and for human food. Phosphorus is important in bone building.

B1599  
CLIPS FOR AUTO LIGHTS SHOW  
WHEN BULB GOES OUT

Motorists driving at night often are unable to tell when a headlight fails and unwittingly drive with only one lamp. To keep them informed as



to the condition of each light, a small double-slotted steel clip that fastens on the headlight rim is being offered. The clip projects just far enough to reflect a tiny spot of light from the lamp to which it is attached, so that the driver will know a bulb has failed when the reflection ceases.

B1676  
PLANT TEST FOR PHOSPHORUS  
REVEALS SOIL CONDITION

by 5  
Expe after years of guessing, the farmer now  
ette able to determine the amount of phosphorus in the soil by a simple method.  
con from growing plants in the soil to be tested, about as many cuttings as would be  
chl used to make a cup of tea are sliced off and crushed slightly with the fingers to bring out the juice. Then the cuttings are placed in a bottle filled with a special chemical compound and shaken vigorously.

Purdue University  
West Lafayette, Ind

A. B. C. Mfg Co  
Quincy, Ill.

Copyrighted material



*Bo 1196*  
*Cont. Derek White.*  
*150 W. Euclid Ave*  
*Detroit Mich*  
*Railway proposed transcontinental*  
*system. Central Manufacturing*  
*Weekend magazine June 19, 1911*

# What is the

## An Amazing Story of the Wonders Promised by the Dawning of the AGE of ALLOYS

By G. EDWARD PENDRAY

NINE persons out of ten, asked to name the lightest metal, will unhesitatingly say aluminum, but they will be wrong.

There are at least seven metallic elements lighter than aluminum. One of these, lithium, is so light that it weighs only half as much as water and floats like cork.

If the present era is one of iron and steel, the next certainly will be one of light alloys. It costs as much to haul a ton of vehicle as it does a ton of payload, whether the vehicle is an automobile, railway car, airplane or dirigible. And so, even the railroads are seeking ways of lightening rolling stock to cut expenses.

It costs \$300 per ton per year to haul an elevated railway car. Lightening a car a

single ton or several tons is absolutely possible to-day, and a \$300 saving per car per year would run into millions of dollars, allowing reduction of rates, changing losses into profits and increasing the life of the equipment.

By constructing the wheels, fuel tanks, control parts and wing ribs of a lighter alloy, an airplane manufacturer saved 400 pounds in weight in a six-passenger ship, increasing his flight range 500 miles. By retaining the same flight range he can carry two extra passengers, and thus increase his revenue thirty-three and one-third per cent.



001196

# LIGHTEST METAL ?

slow Chemical Co  
919 Jefferson  
mcdonald, Mich



Top, Holding Aloft Two Ten-Foot Beams of Magnesium Alloy, Weighing Thirty Pounds Each; Above, Applying Aluminum Paint

The first answer of metallurgists to the demand for lightness was the development of aluminum and its alloys. From a rather expensive curiosity, this metal has within a few years become a structural material so common that it is now being used for the fabrication of objects all the way from kitchen utensils to flat cars. The success of these alloys makes the idea of using

lithium and the other extremely light metals seem considerably less fantastic and unattainable today than it might only a few years ago.

The seven metallic elements lighter than aluminum, in the order of increasing lightness, are strontium, beryllium, magnesium, calcium, sodium, potassium and lithium. Of these, the last three are lighter than water.

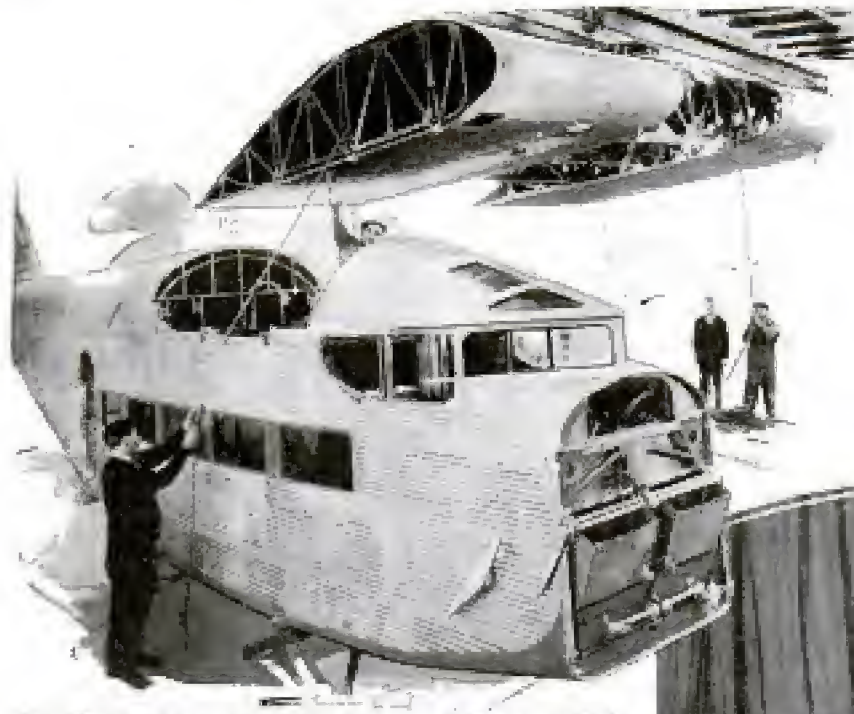
In the case of every one of these, the pure form is practically useless, because of lack of strength, rapid corrosion in air or water, low melting point, extreme softness, or other factors.

In spite of these obstacles, rapid progress is being made toward overcoming objections to the use of some of these metals in structural work. Magnesium alloys are now manufactured in commercial quantities.

Aluminum Company of America  
2449 Olive Bldg. Pittsburgh, Pa



1196  
876



The Entire Skin and Main Structural Parts of This Airplane Are Made of Aluminum Alloy

ties both in this country and in Germany, being pumped in the form of brine from ordinary wells.

This is the only metal that is not mined and produced from ore. Its base is magnesium, and while magnesium itself has been known for more than a hundred years, it was not until recently that it became commercially available.

Magnesium is very little heavier than wood, yet has the strength of mild steel, and is the third most abundant structural metal in the world. This makes it seventy times as plentiful as nickel, 200 times as abundant as copper, and of all engineering metals, it is surpassed in quantity by two only—aluminum and iron.

Pumped through underground pipes into giant tanks, one of which has a capacity of 1,000,000 gallons, the solution is subjected to processes which remove the calcium chloride and bromide. The remaining magnesium chloride is dried, and the final operation consists in flowing it into large electrolytic cells, where it is melted with common salt under terrific heat. A powerful current is then shot through the bath and decomposes the magnesium chloride into chlorine gas, which is carried away, and magnesium metal that floats as a silvery layer and is immediately skimmed off and cast into ingots.

But magnesium, like nearly all metals

is little used in its pure state, because of its low strength and lack of toughness. Small quantities of other metals, such as aluminum, manganese, copper, zinc, tin and cadmium are melted together with magnesium, and suitable alloys are produced, ranging from ninety-two to ninety-eight-per-cent magnesi



Lightweight Metal Chairs Constructed of Magnesium Alloy; Each Weighs Seven and One-Half Pounds

um, so all its characteristics, mainly lightness, are retained.

This new series of alloys is indicative of what industry is doing to develop new possibilities in structures. It indicates that old problems are being looked upon with new minds. The production of this lightweight material has increased twenty times in the past few years and the cost has been reduced from \$5 a pound to thirty cents.

What does this mean to the world?

W. A. Mankey, eminent aeronautical and mechanical engineer, has estimated that needless weight in automobiles, airplanes and other means of transportation is costing the traveling public \$10,000,000 per year in tires, fuel, overhead and other operating expenses. Lessening the weight

*Aluminum Company of America 2449 Alameda*

*912 Jefferson Ave  
Midland, Mich*

*Wm. C. Brown Chemical Co*

*Pittsburgh, Pa*



Law Chemical 877  
919 Jefferson  
Midland  
Tex

of rotating and reciprocating parts of machinery gives increased speed and minimizes vibration and wear.

The advantage of light weight in portable tools is obvious. Tests have proved that reducing the weight of a riveting machine or portable drill reduced workman fatigue and gave increased output in proportion to the reduction.

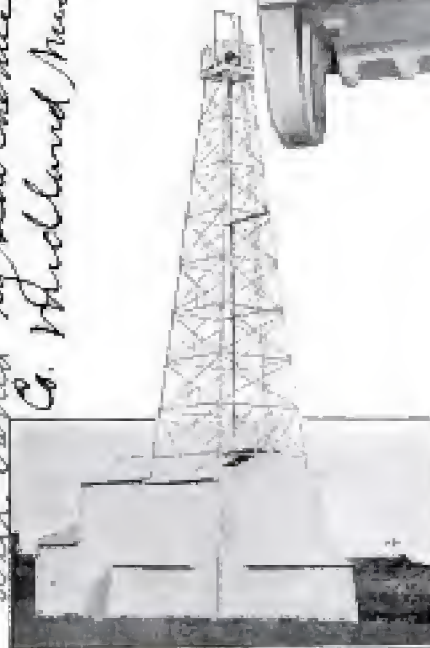
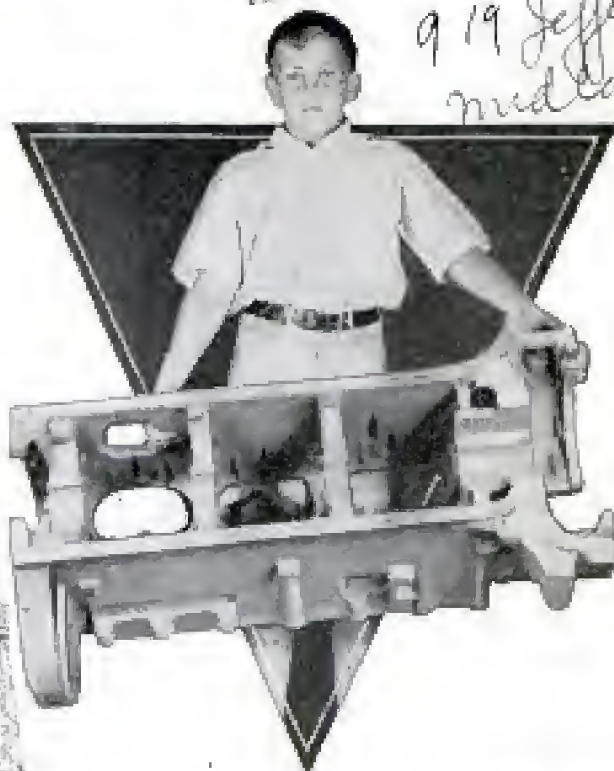
In the home, appliances to make the work of the housewife easier still can be improved. Vacuum cleaners, ironers, carpet sweepers, through lighter weight, would be more easily operated and require much less energy and time.

But how about the cost of attaining lightness? The savings in operating cost, and the advantage of longer life, will more than offset the additional cost of lighter metal in many products, and engineers are learning that weight does not mean strength.

The development of successful magnesium alloys is a first and important step in the harnessing of the seven light metals to structural use. The next most successful alloys to date are those of beryllium. These weigh a trifle more than magnesium, but have an advantage in the higher melting point of beryllium, which is nearly that of iron.

The principal disadvantage of beryllium alloys is the cost. The pure metal cannot now be obtained for much less than \$100 a pound, but by certain short-cuts in the process of manufacture when alloys are to be made, they can be bought at \$50 to \$60 a pound. This price is still much too high for general purposes, but the alloys will be used where lightness, high melting point and great strength are important enough to offset the cost.

The field of experimentation in alloys of these light metals is one that will become increasingly important. The development of aircraft and fast vehicles on land and water has stimulated it; the future construction of huge dirigibles and



perhaps of rocket ships will make an even greater demand.

Engineers are working, but the most radical improvements may come out of a great factory or laboratory—or out of a back-yard shop.

Well owned by Law Chemical Co. Midland Texas

Top, Magnesium-Alloy Crankcase; Center, Magnesium-Chloride Well; Below, Aluminum Elevator Doors

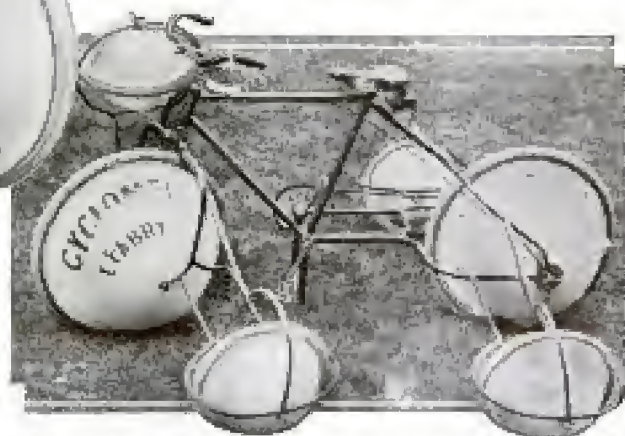


Paris, 20

Bicycle with Stabilizers  
for Travel on Land or  
Water; When Lowered,  
the Auxiliary Rollers  
Hold the Vehicle Steady  
in the Water



old roofs showed it consisted almost entirely of copper sulphate. Sulphur dioxide from burning coal provides the sulphur that reacts with the copper, but even in badly polluted industrial atmospheres from ten to fourteen years has been required to develop the coloring by natural weathering. Architects demanded a quicker method, and a ten-per-cent solution of ammonium sulphate was found to be an effective coloring chemical. In England, an electrolytic method is used that requires only fifteen minutes, after it was found that some ammonium-sul-



Wide World

### BICYCLE ON DRUMS TRAVELS ON LAND OR WATER

At home on either land or water, a bicycle equipped with stabilizers has made its appearance in Paris. It is known as a "cyclonier" and has two large drum-shaped wheels to each of which are attached two smaller spheres which can be raised or lowered. When lowered the auxiliary rollers serve as stabilizers for water travel. On land the small spheres are raised and the vehicle travels like an ordinary bicycle.

phate solution treatments tended to break down under severe weather conditions.

### NUMBER OF MILES PER GALLON TOLD BY AUTO METER

Motorists now can measure the exact mileage per gallon of gasoline their cars deliver at any speed with the aid of a motor-performance meter which attaches to the steering-wheel post. It is about the size of a volt meter and is electrically operated. An indicating hand swings from left to right, depending on speed, and by dividing the speedometer reading in miles



per hour by the meter reading in gallons per hour, the miles per gallon figure is reached. For instance, if the meter points to four at a speed of forty miles an hour,

### COPPER ROOF QUICKLY AGED WITH CHEMICAL BATH

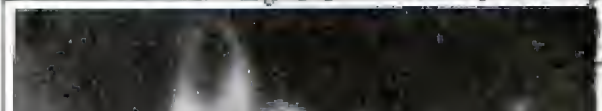
Previously the green color that copper and its alloys assume after years of exposure to the weather had been considered as reliable an indication of its age as wrinkles and gray hair in a human being, but this is no longer true. Two metallurgists have worked out a method for the rapid development of patina on copper, and now a few sprayings with a chemical can turn the freshest copper roof or spire into one of venerable appearance within twenty-four hours. Discovery of the method was delayed because the patina had been considered to be a copper carbonate, while analysis of green coloring matter on

John R. Freeman, Jr.  
P. H. Kirby,

A. L. A. Co.  
Elizabeth N. J.



B/60 4 Cont. Aene  
Leonhardt, T. M. M. M.  
MECHANICS 879  
H. G. Berlin - Steadily



01643

Valuable trees may soon be protected by lightning rods as the result of a recent experience in Washington. A large magnolia tree was transplanted and was still supported by four steel cables when it was struck by lightning. It was found the cables had acted as a ground and the tree is expected to survive. Tests are now being conducted to determine if some such conductors might offer protection for any valuable tree whose owners wish to go to the expense of guarding it.

001594

Only thirteen inches high and twenty inches long, a model of the old-fashioned steam fire engine, now in the Smithsonian Institution, is able to throw a stream of water forty feet. It was constructed in 1912, largely from memory of the fire engines that were in common use until a few years ago. It is complete in every detail, and a feature is the hand-fired boiler that generates steam to force water out.



**This Model Fire Engine Can Send a Stream Forty Feet; It Is Complete in All Details**

Presented by Frank  
A. Wardlow, Jr.  
New York City -



"Persil," Name of German Manufacturer, Is Spelled on the Clouds by Giant Searchlight

Equipped with one of the most powerful projectors in the world, a German ship is cruising in the Baltic sea and writing in the night sky with a 3,000,000,000-candle-power light. According to Professor Gehloff, astronomer, this light would appear to someone on the moon as coming from a star of about the sixth order. A frame requiring the utmost accuracy of adjustment is used in projecting the letters, an incorrect adjustment of one-five-hundredth of an inch resulting in deviations of fifty feet when the letters are projected onto the sky. The frame has 30,000 parts.

Popular Mechanics Magazine does not publish the name of the maker or seller of any device described in its pages, but this will be furnished free upon application to our Bureau of Information.



1393 Cmt. Elmer Glassman  
55 W. 86 St. New York



T-6

## *The Latest* **GIANT**



By D. N. GLASS

**T**HE largest moving object on this planet has been launched into the sea. It bursts with strength, but responds to a man's touch; it looks colossal, but moves with the grace of a greyhound. It is a ship.

This ship is the answer to the demand for more speed, endurance, safety and comfort on the transatlantic boulevards. Her activities will be confined to one

ocean, where she will swim between two ports like a whale within a tank. To the west, the Panama canal shuts her out of the Pacific, and to the east, the Suez canal bars her from the Indian ocean. No such colossus was ever imagined by the engineers who designed these important sea links.

In order to visit the far east this new ship, tentatively called the "T-6," will have to go via the Arctic or Antarctic seas. And only New York and Havre will accommodate her with a berth and provisions.

The great "T-6," which will require about five years to build, is sponsored by





# of the *SEA*

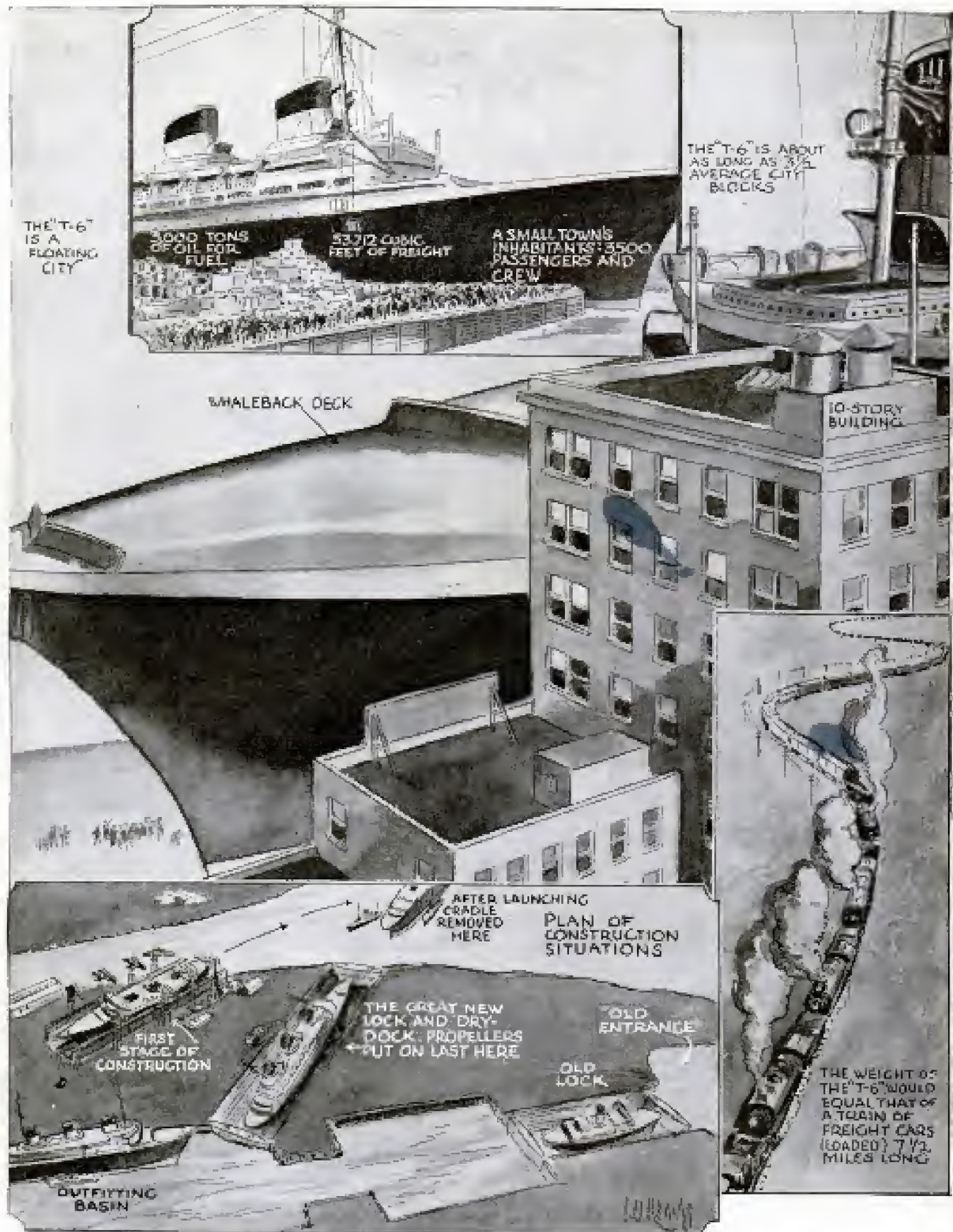
the French line and the French government. Dimensions alone do not make her a ship for history. But it is her size which allows the multiple wonders which form the "T-6." Her length over all is 1,014.6 feet; her beam, 117.81 feet. The ten decks between the engine room and sun deck are served by ten elevators, each with a capacity of thirty passengers. The four turbines will develop 160,000 horsepower, capable of driving forward the "T-6's" 75,000 tons at a speed of 34.54 miles per hour.

Not a piece of coal will be found on board. The power plant consists of four steam turbines coupled directly to gener-

ators which will supply electricity to four motors. Each turbine runs independently. All the ship's accessory machinery is electrified.

The "T-6's" staggering dimensions are made possible by an intensive application of the most modern practices in science and marine architecture. To wit, in planning the interior, her designers realized that no dining room worthy of such a ship could be built unless the funnels 'tween decks were removed from their traditional place. In order to have sweeping, unobstructed interiors, it was necessary to run the funnels up near the port and starboard sides of the ship, instead of through the ship's center line. By such ingenious planning, they achieved the largest room afloat, and what is probably one of the world's largest dining halls. It is three stories high from end to end and commands a clear view for 400 feet. Without the least crowding, the "T-6" could trans-



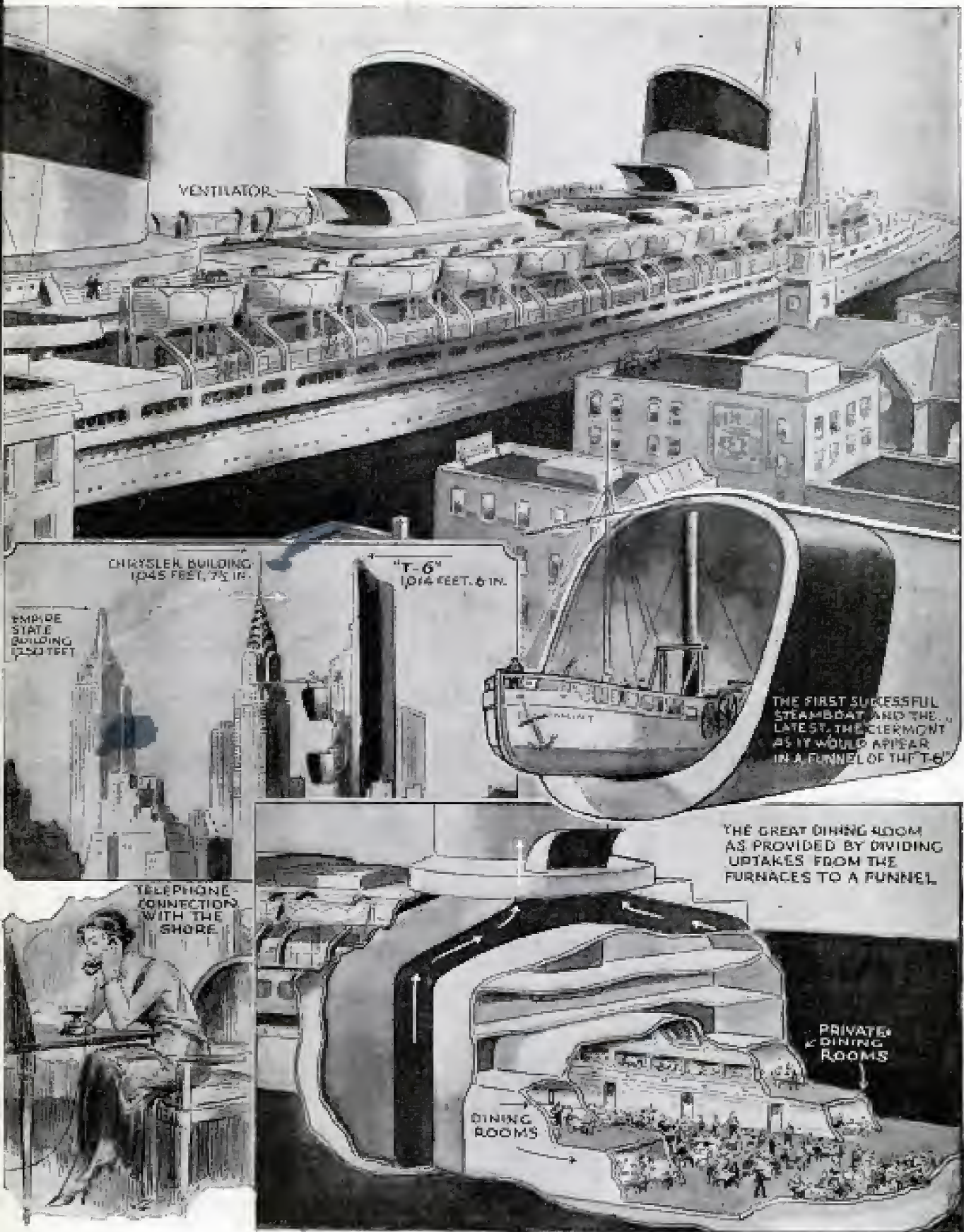


port a city of 125,000 people across the Atlantic in fifty weeks. If stood on her end, she would soar above the Chrysler tower and dwarf the Woolworth building.

The "T-6" will carry enough oil and water in her double bottom to float a large Mississippi river passenger steamer.

The main dining room will accommo-

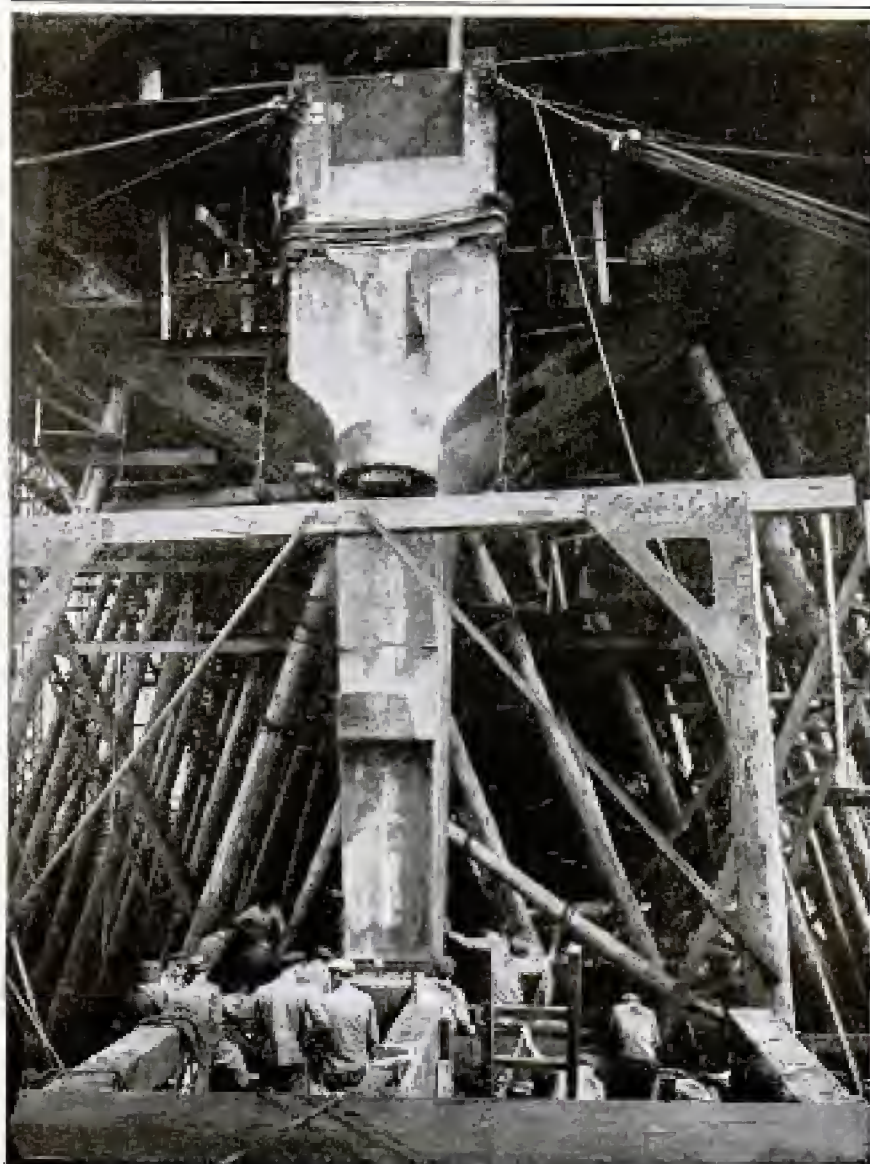




date 1,000 people at one sitting; the combined capacity of all her dining rooms is 2,300 people for one sitting. The kitchens will be equipped to serve 10,000 meals per

day and 40,000 to 50,000 meals on the average crossing. Four hundred waiters will operate out of the main kitchen at one time, and 165 chefs will prepare food for





data and public habits proves the practicability of a 75,000-ton ship, according to Pierre Malglaive, director of the French line, in charge of building the "T-6."

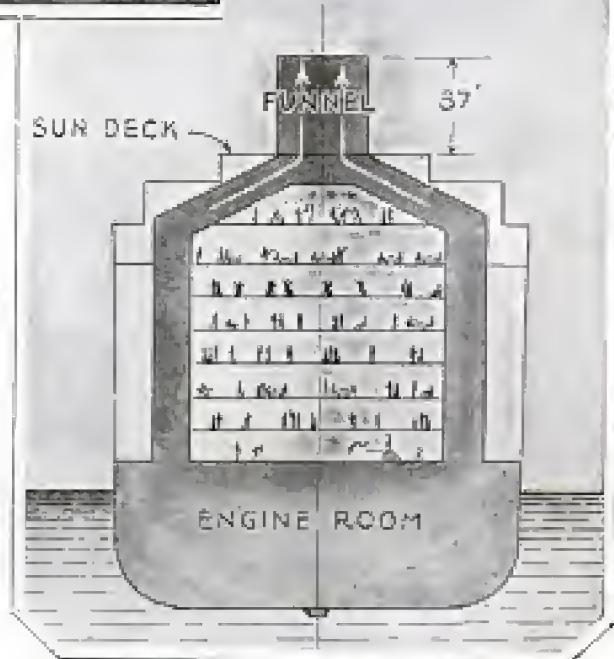
If Columbus in his flagship and the "T-6" had started across the Atlantic simultaneously, the latter would have arrived in America when Columbus had covered only 500 miles! The "T-6" could circumnavigate the globe at the equator in thirty days of running time. In a race around the equator between the Twentieth Century Limited and the "T-6," the famous train would beat the ship back to the home plate by only ten days.

The ship's bow presents a number of unique and promising characteristics. It is neither like the full bulbous bow on the "Bre-

the 2,200-odd passengers. The crew of 1,000 will be served from a separate kitchen. About 60,000 pieces of chinaware and crockery will be necessary to serve passengers. For the dining service alone, 150,000 pieces of linen are necessary; for all services, the ship will need 400,000 pieces.

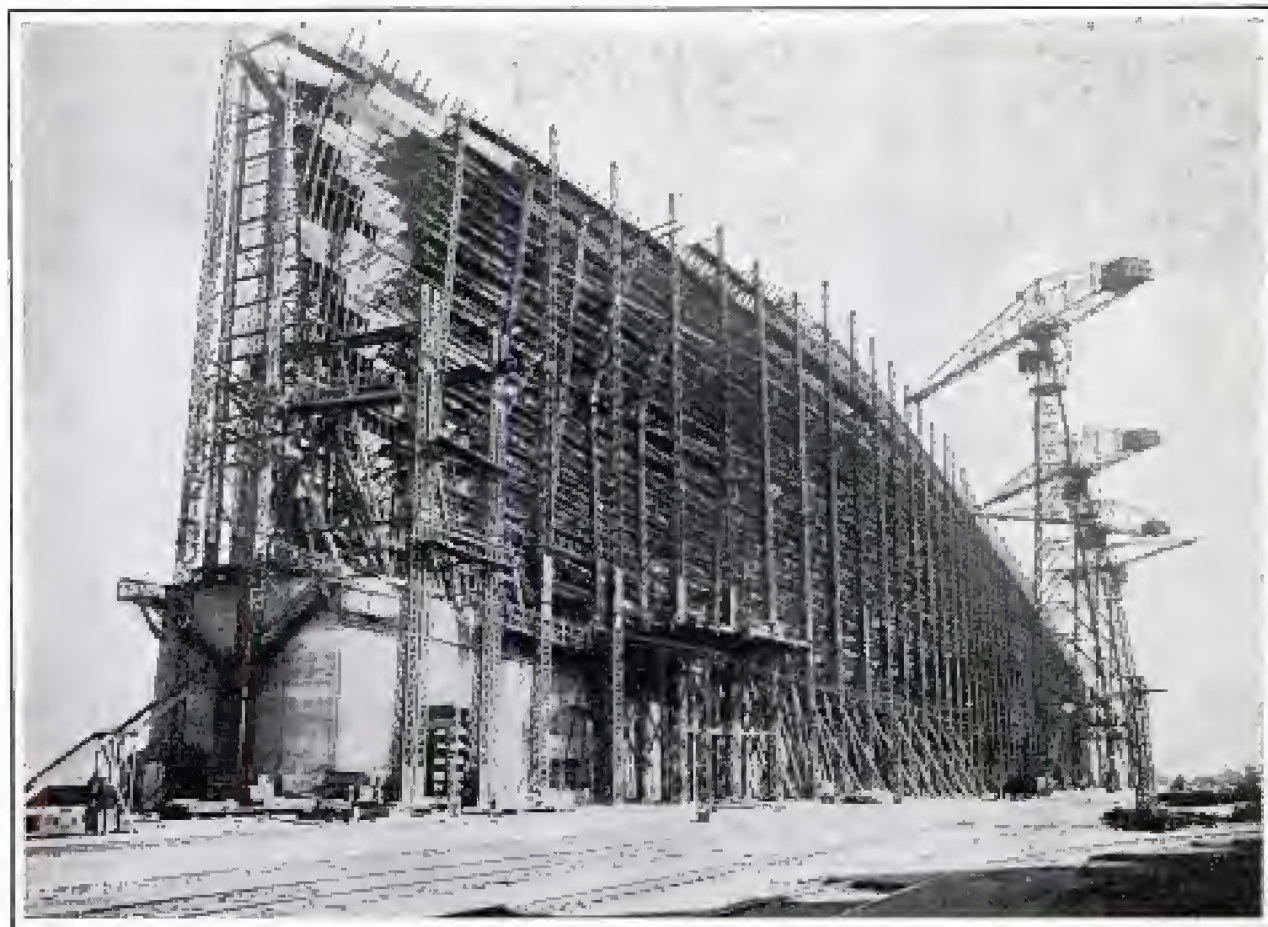
Robert Fulton's first steamship, the "Clermont," could easily fit inside one of the new ship's three funnels. Henrik Hudson's flagship, the "Half Moon," could fit into a small corner of the engine room.

The "T-6" does not represent an attempt to build a ship in order to establish or beat a record. The economics of shipping demand, first, that the ship pay back the \$28,000,000 cost of construction as well as provide for maintenance and a reasonable profit. A careful analysis of shipping



Above, Close-Up of the Huge Rudder Post; Below, Sectional View of the Ship; Note the Divided Uptake from Engine Room to Funnel





Hull of the "T-6" under Construction; One of the Unusual Features Is the "Whaleback Bow" with a Curved Deck Designed to Throw Off the Crushing Weight of Water and Decrease Wind Resistance

men," nor like the old-fashioned knife-edge type, but is clipper-shaped with a very graceful semihulbous effect near the keel; it curves up into a rounded, streamlined rigid deck covering such as no ship is known to have.

Passenger recreation is provided for by numerous deck sports such as tennis, clay-pigeon shooting, and squash. Besides, there is a large swimming pool, a first-class gymnasium, a Punch and Judy show, and the first fixed theater ever built into an ocean vessel. This theater will have permanent seats accommodating 400 persons. The stage will be large enough for the production of full-length plays, musical revues, operettas and tableaux.

A new method of addressing audiences at sea will be found on the "T-6." By talking into a microphone in his cabin, the captain, or any other person, will be heard in all the public rooms. Concerts and radio talks picked out of the air can be re-broadcast likewise. In emergencies, the captain can talk directly into the ear of every person on board, even though the "T-6" is almost one-fifth of a mile long.

Passengers may speak with friends through an inter-cabin telephone system such as prevails in hotels on land. They will also carry on two-way conversations with phone subscribers in Europe or America—without leaving the confines of their respective cabins.

### V-SHAPED BELT BUILT LIKE COG PREVENTS BINDING

Built like a cog, a V-shaped belt of fabric and rubber is obtainable for all types of shop equipment using a multiple belt drive. The cogs do not engage in use like regular gear teeth, but provide flexibility and prevent sidewise distortion which might tend to bind in the wedge-shaped grooves of the pulleys.



Llayton Rubber Inc.  
Llayton, Ohio



B/605

made in Germany  
maker unknown

Cml. James Montagna  
608 Harbour Commerce

886

POPULAR MECHANICS

Carl Gardner & Wilson  
1055 B'way

old  
Toronto, Ont.

### SEA LIONS KILLED TO PREVENT SLAUGHTER OF SALMON

More than 1,100 sea lions and pups paid the penalty of belonging to a too numerous race a few months ago when that number of animals were killed during the annual government hunt of lions off the coast of British Columbia. Too many sea lions play havoc with the salmon fisheries, so each year the excess animals are killed off. Despite the annual weeding out, the sea lions are still one of the greatest dangers faced by the salmon. They are very wild and difficult to reach on their lonely rookeries near the mouth of the Skeena river, and bad weather often hampers the summer hunting operations.

B/674



Piano with Two Keyboards, Two Sounding Boards and Two Sets of Strings Used in Radio Studio

### PIANO WITH TWIN KEYBOARDS USED FOR RADIO

One radio-broadcasting company is using a piano with two keyboards that sounds like two instruments when played. Except for the double keyboard, the piano looks like any other instrument and is played by one person. It was made in Germany and has two sounding boards and two sets of strings.

### COLDEST COLD EVER PRODUCED IS NEAR ABSOLUTE ZERO

Absolute zero, the completely cold point at which all temperature ceases and heat vanishes, is now only seven-tenths of a degree beyond the reach of man. Absolute zero is 273 degrees Centigrade below the freezing point of water, and Prof. W. H. Keesom, of Leiden University, in Holland, has succeeded in producing a temperature of minus 272.3 degrees. He obtained this low reading by keeping a small quantity of liquid helium stirred while producing a high vacuum over it with two powerful mercury pumps. This is one-tenth of a degree below the previous record, but when absolute zero is the goal, the last few tenths of degrees are like the last few hundred feet in scaling a mountain.

### FLASHLIGHT WITH NO BATTERY HAS ITS OWN GENERATOR

Instead of a battery, a flashlight recently developed has a small and compact generator operated by a spring. Twisting the small end of the light winds the spring to operate the dynamo. A few turns assure constant light for a considerable length of time, and at the first signs of dimming a few more twists renew the brightness. The light may be focused with one hand, using the same button that turns it on and off. Each light is equipped with three lamps, the two spares resting in a space back of the reflector.



Flashlight without a Battery; Twisting Small End Winds a Spring Which Operates a Generator

Probably Columbia Broadcasting System. 485 Madison Ave. New York.

Science Service 9/14/32

Bat. Les Lite Corp.  
414 Broadway  
Albany, N.Y.

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# How do *You* do it?

*Push a Car  
Open a Window  
Lift a Wheelbarrow*

It's not a question of how much muscle you have. By no means—rather, the big thing is, how do you do it?

Here's a stalled car. Out you go for the big push. Do you go at the job as marked wrong—all abdominal and arm muscles? Or, do you work with the heavy back and leg muscles as pictured in the second sketch. You can push half again as much, and this with less strain, by using the latter method.

Maybe you own a boat. Compare the



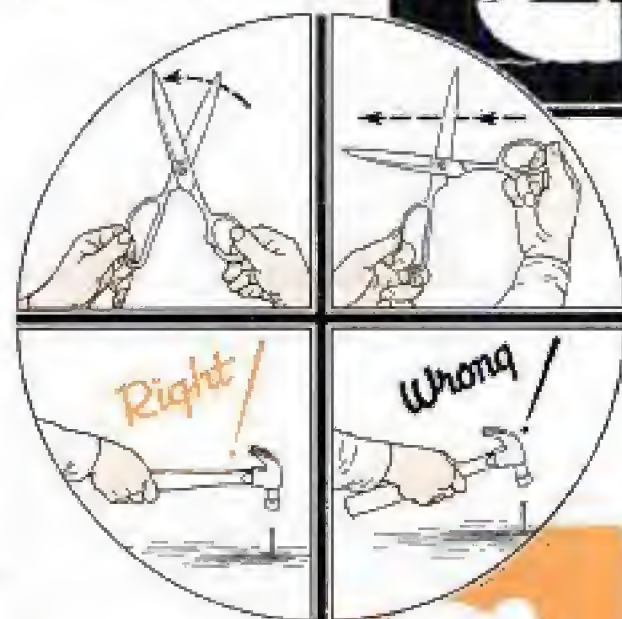
accuracy, but half-way down the handle and you are exerting twice as much force to drive the nail.

Everybody lifts. It may be the furnace ashes, or a clothes basket, or a

wheelbarrow. The correct procedure is the same in every case: Squat, don't bend. Bending at the waist to pick up a weight puts a terrific strain on the pelvic bones and surrounding muscles; squatting, you put the load squarely up to the stronger leg and back muscles.

This simple thing of opening a jammed window. Don't try to lift it with the fore edge of your hands along the sash edge.

Get under it. Catch the sash on the heels of your hands and push. The action is entirely different—as different as right and wrong should be. Remember to get close to the weight,



mechanical actions shown in the upper part of the circle and you can easily see that fending with the feet should be done as shown in the first right-hand sketch above and not in the scissorlike manner indicated in the second.

Leverage is a great thing. Most people realize that a little man on the end of a long lever can lift an enormous weight. Yet, give the average person a hammer and bang goes the idea of the lever. Choking a hammer may add a little to your





*Lookout Point, Grand View  
on route 30, near Leggett.*



Hotel and Restaurant Built Like a Steamship Standing on a Prominence in Allegheny Mountains

### STEAMSHIP ON MOUNTAINSIDE IS ROADSIDE RESTAURANT

Motorists following the Lincoln highway through the Allegheny mountains east of Pittsburgh are amazed to find a "steamship" perched on the side of a moun-

tain at one point where there is a particularly fine view of the surrounding country. The structure is a hotel and restaurant, built in the form of a boat, and stands at an elevation of 2,464 feet. From its deck, tourists look into three states and seven counties.

### UNITED STATES IN THIRD PLACE IN MOTOR-SHIP NUMBERS

America has advanced to third place in the number of motor ships in operation since 1915, when not a single motor vessel was running under the Stars and Stripes. At the close of 1931, the United States was surpassed by only Great Britain and Norway in the number of such craft. This country had a total of eighty-four motor ships in operation with a gross tonnage of 544,673, Great Britain had 364 of 2,621,914 gross tons, and Norway 276 of 1,651,407 tons, out of a world total of 1,275 vessels with an aggregate gross tonnage of 8,510,634. While this country is third in number of motor vessels, it is surpassed in aggregate tonnage by the Netherlands with eighty-three vessels and a gross tonnage of 623,065. Sweden also has eighty-three such vessels, but with a lesser tonnage.

During the first half of this year, America built no new motor ships. In size of vessels, the United States is surpassed by eight other nations, this country having no vessels in the 15,000 to 30,000-ton class.

### STABILIZER ON STEERING GEAR CURES DRIVING TROUBLES



Many of the automobile driver's steering troubles are eliminated by a stabilizer that holds the tie-rod at a uniform tension. It is said to stop wheel wobble, oscillation of steering wheel and shimmying, and to make all steering easier. It is installed by clamping on the front axle and to the tie-rod.

Hoof Products Co.  
162 N. Franklin  
Chicago

*U.S. Steady 9/16/31*

*U.S. Shipping Board*



Chas. Harry K.  
Hobart.

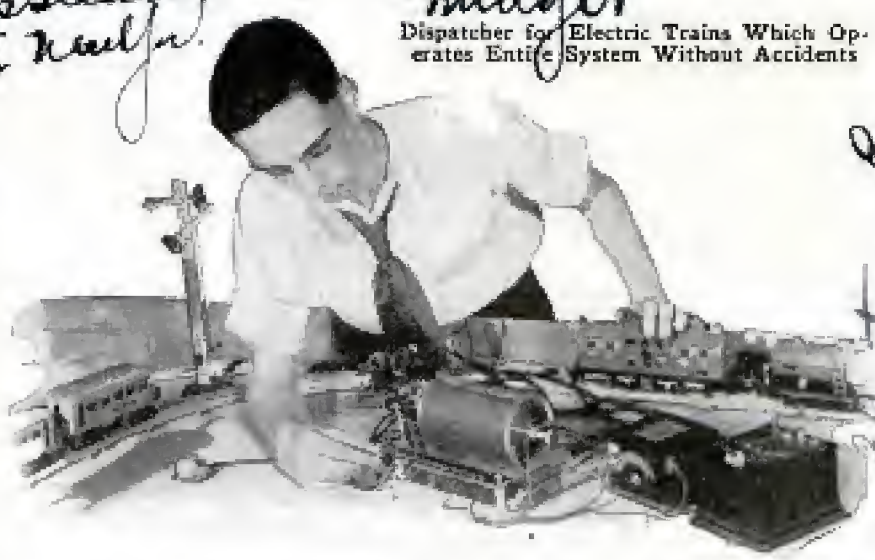
B1651

POPULAR MECHANICS  
LIGHT FILAMENTS  
ONE-TENTH SIZE

889

OF HAIR

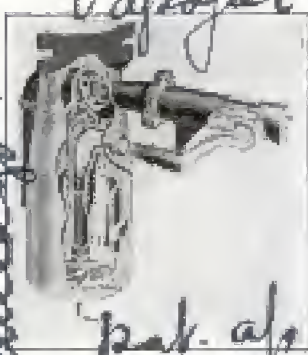
Diamond dies one-tenth the size of a man's hair are used in drawing the tiny filaments for the six-watt incandescent lamp. These dies, many of which are produced in Trevoux, France are made by boring tiny holes in rough-cut diamonds. In the making of filaments, the tungsten is drawn through ninety-five dies, each with a smaller hole, until the last is a mere speck. Enough filament wire for 666,666 lamps is drawn from a bar of tungsten three-eighths of an inch square and twenty-four inches long, weighing one and one-third pounds. So small are the die holes that as many as thirty attempts often are made before a good die results. A conical hole is drilled halfway through each side of the diamond and where they meet, the die is formed.



DISPATCHER FOR TOY RAILROAD PREVENTS COLLISIONS

When used with a toy electric-train layout, a miniature automatic dispatcher permits a boy to run from two to five trains over his system without collisions or other interference. The dispatcher also turns on lights at predetermined times, throws switches, sidetracks slow trains to give the right of way to faster ones and makes it possible to lay out a whole schedule of movement for trains, switches and accessories requiring six minutes to complete. The operator decides the maneuvers he wishes to accomplish, then cuts holes in a paper revolving drum, each hole representing one maneuver. If the holes are properly cut, the miniature railroad goes into operation when a switch is pressed.

OIL VAPORIZER FOR SHOPS CUTS HEATING COSTS



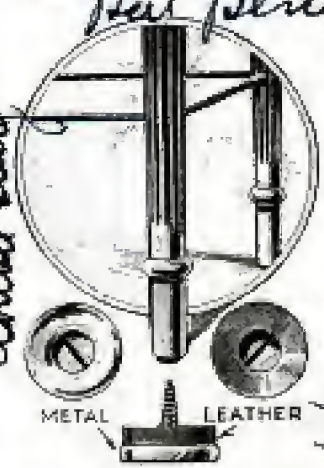
Low-cost oil now may be utilized as a practical substitute for gas in industrial heating by means of a vaporizer which atomizes the liquid fuel to a highly combustible mixture. A feature of

this vaporizer is its accurate and positive temperature control, making it adaptable to virtually all heating operations from kiln baking to high-speed-steel treatment. The unit is simple in design and construction, without working parts. Atomization is attained by subjecting the fuel oil to the heat of a pilot flame. Complete combustion prevents smoke, soot or odor, and blast noises are negligible owing to the low air pressure required for various heats

The rainiest time is late afternoon and early evening, weather reports show.

FURNITURE LEG TIPS REVERSE TO PROTECT FLOOR OR RUG

Reversible tips for the legs of chairs, tables and other furniture are available for the protection of floors and rugs. One side of the tip, which is attached to the end of each leg, is made of nickel-plated steel, while the other is of leather impregnated with wax, which produces a resilient wearing surface.



Western Electric Co  
Racine, Wis

Chicago 6300 S. Halsted  
Englewood

Railway Locomotor Co 59 E. Van Buren

Scene Newsletter  
8/2 7/3 2

P. H. Specialties  
Box 84, Edgemoor  
Stator, Providence, R.I.



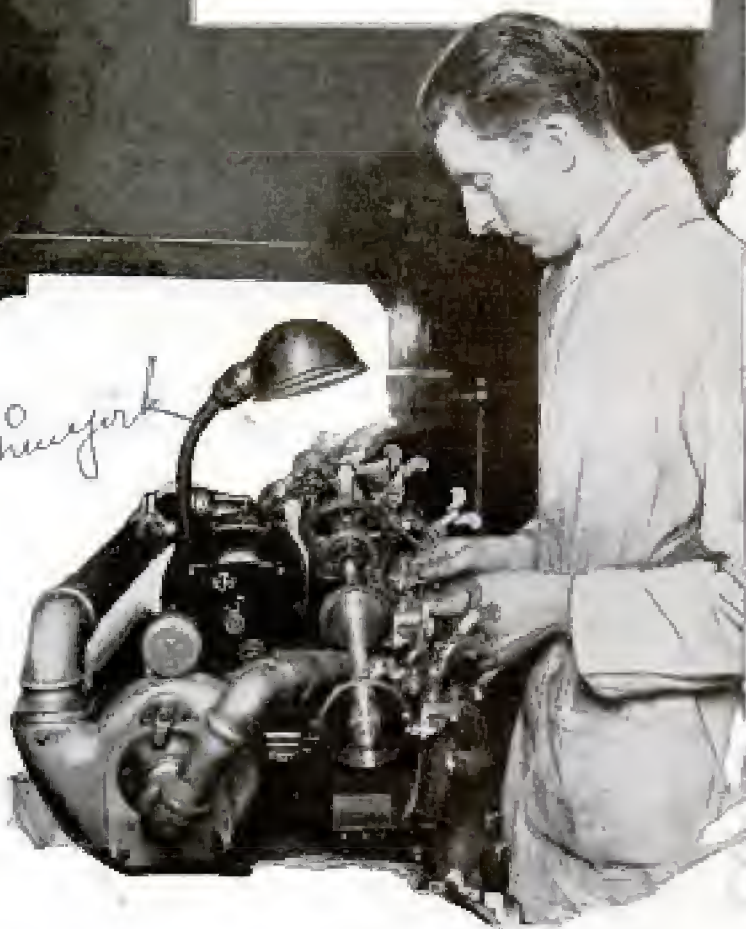
B 1449

Harrison & Co  
209 Centre  
New York

Briggs Key Machine  
Co 407 East St  
Delmonte, Mich

# The ART of

Left, the Locksmith Uses the Same Tools Employed by the Burglar in Conquering Combination Locks; Here an Expert Is Drilling a Hole in the Door of a Safe to Get at the Tumblers of Such a Lock. When He Reaches the Tumblers, Opening the Safe Door Is a Simple Task; Below, a Modern Key-Making Machine, a Far Cry from the Simple Equipment Carried by the Itinerant Locksmith of the Streets a Few Years Ago



By JACOB DESCHIN

1510  
Deschamps Ave. New York

WHETHER it be a call to recover property, save lives in a burning building or prevent a suicide, the expert locksmith accepts it as part of his daily round. Picking locks is his trade, and if now and then he picks up a little adventure on the side, why that's all to the good.

The term "locksmith" invariably suggests the itinerant maker of duplicate keys who patrols our streets in the company of the umbrella mender and the scissors grinder. How surprised, therefore, was the general public recently when an expert locksmith, Charles M. Courtney, president of the American Association of Master Locksmiths, was summoned to Europe to advise the salvagers of the gold bullion in the bulk of the sunken liner "Egypt" on how to open the safes without resorting to the torch. The locksmith was able to give the divers such exact instructions that the two remaining safes were opened as if the actual keys had been in hand.

While in Europe, Courtney unlocked a safe in a cellar of a former palace of the Hohenzollerns, in Kiel, Germany, which had not been opened since 1918. What lay inside that safe the locksmith never knew. And herein lies the peculiar irony of the locksmith's trade. His job is to pick the lock, but what lies behind the closed door remains to him, if the owner so wishes it, as much a secret as ever.

The locksmith is satisfied to let it go at that. He never lets curiosity get the bet-

530 - W. 125th St New York



# PICKING LOCKS



Top, Charles M. Courtney, Expert Locksmith, in His Workshop;  
Below, Ornate Key of the Last Century

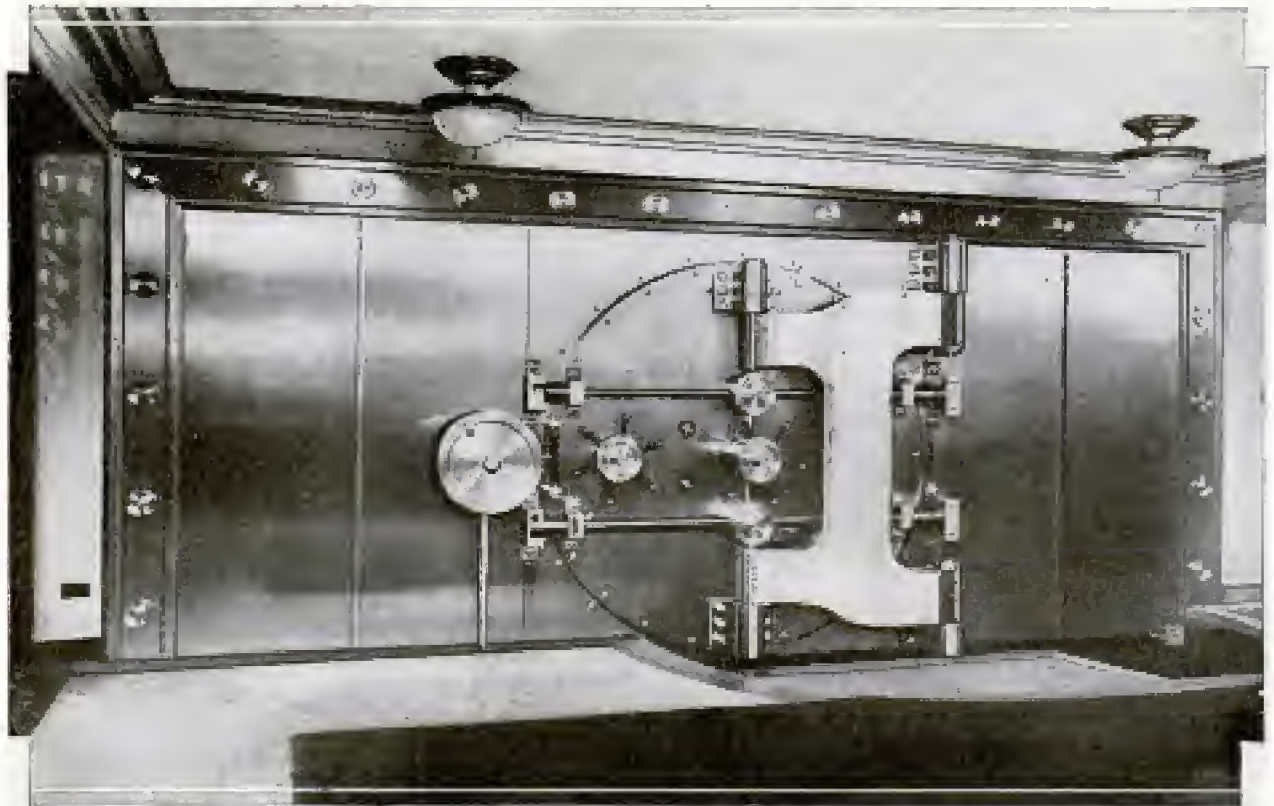
There are, however, unscrupulous locksmiths who will, for instance, keep a copy of a key when asked to make a duplicate or repair a lock. Illustrating this is the story of a locksmith with a shady sense of honor, who, upon being commissioned to make a duplicate key for a certain large office, made an additional one for himself, which he later used in entering the office on several occasions and rifling the desks.

The modern lock traces its lineage directly to the wooden lock and key of the Egyptians of 4,000 years ago, who devised a principle of security which is basically the same as that of the best locks of today. Essentially this consisted of a long wooden key, at one end of which were placed a number of iron pegs, these pegs being so arranged as to come in contact with corresponding loose pins in the casing of the lock. Upon insertion of the key, the pins were lifted by the pegs, thus permitting the free

movement of the lock bolt. Since then it has been a matter of improvements in the methods of manufacture and in workmanship, but the basic principle has always been about the same. In the last century Linus Yale, Jr., adapting the pin-tumbler system of the Egyptians, gave the world a

ter of him, for when it is considered how similar are the immediate objectives of the locksmith and the burglar, although their interests part beyond the actual opening of the lock, it can be seen how easily a locksmith may give his client a wrong impression as to his motive.





Locksmiths Sometimes Are Called On to Open Huge Doors Such as This; Note the Giant Hinge on Which the Tremendous Weight of the Door Swings When the Combination Is Released

lock which could be opened with a flat, convenient key, in place of the round, heavy one in use up to that time.

The warded lock, comprising a plate with wards, or protuberances, which calls for a key that has been cut in such a way as to clear the wards, came into being in the Middle Ages. In 1778, a man named Barron combined the warded lock with the tumbler, this latter consisting of a notch in the bolt, into which a lever had to drop before the bolt could be drawn back by the key. This principle, improved upon by one inventor after another, finally brought us to the combination, keyless lock of today which is operated by means of a dial.

Locksmiths who have proved their ability and received some publicity on this account live always under the cloud of the danger of being shanghaied into the service of a gang of burglars. Constantly on their guard lest, by some ruse, they be made the innocent perpetrators of a robbery, they will never make a key from a wax impression or a drawing or a lock number, nor will they agree to pick a lock for a person unknown to them unless a recognized authority like a policeman is present.

There is, however, the story of a self-styled "minister," dressed in appropriate garb, who one day asked a locksmith to open the front door of his church as he had left the key at home. As the locksmith was picking the lock, he noticed that the minister suddenly took to his heels. Another minister had arrived on the scene—the real one this time—and the locksmith was left "holding the bag." He soon convinced the minister of his innocence.

Expert locksmiths are unanimously of the conviction that there never has existed any such romantic personage as a "Jimmy Valentine," that lovable crook of the imagination who sandpapered his fingers to make the tumblers drop and save the girl. In the first place, they say, nobody can solve the combination on a safe, and in the second place, the tumblers do not drop.

Some years ago a burglar picked the lock of the street door of an office building, climbed to the tenth floor, unobserved despite the presence of a watchman and scrubwomen, picked the locks of four doors leading into and between offices, worked the combinations on three different safes, and, to make matters complete,

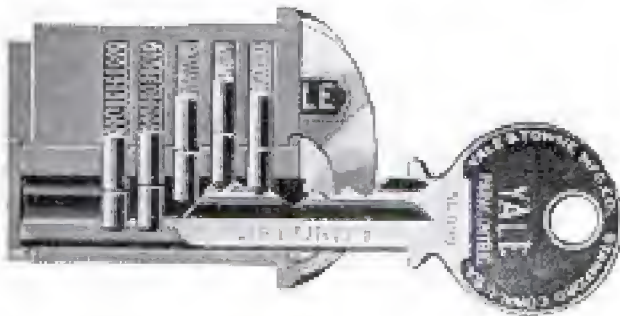


picked the locks of several desks, his exploit netting him a total of \$200,000 in stocks, bonds and money. The public admiringly dubbed him a Jimmy Valentine in the flesh, but the experts among the locksmiths said he was a locksmith who had somehow learned the combinations of the safes.

Sometimes the locksmith risks his life in the pursuit of his trade. At Lafayette, Ind., some time ago, burglars had drilled a safe, inserted explosives, and lighted the fuse, but, contrary to reasonable expectations, no explosion resulted. Puzzled, they abandoned the task and departed, leaving a note warning all not to try to open the safe as there were dangerous explosives inside. The next morning an expert locksmith was called. First he made the explosive material inactive by admitting a chemical liquid through the hole made in the safe by the drill. Then, using a drill to line up the tumblers,



Above. Using Delicate Instruments to Pick Lock Inside a Safe; Left. Showing Mechanism of Yale Lock as Key Is Inserted



he soon opened the door and disposed of the now lifeless explosives.

The locksmith is frequently called upon by the police to act with them in making a raid on a speakeasy or a gang of thieves. His job is to pick the lock on a back door or a left door within a fraction of a minute, as the possibility is always imminent that they will be

prematurely discovered, with the consequent flight of the thieves or immediate hiding or destruction of the sought-for evidence.

The expert locksmith, unless forced to do so, never breaks open a lock or uses violence. This is unprofessional, smacks of the cracksman's methods and causes damage. Tools are all-important. The

(Continued to page 121A)





B1685  
894

Cont. W. Henry Boller, 1846  
N. Bourne St

POPULAR MECHANICS

Phila

# Progress of Fire Fighting Since Revolution



Above, Philadelphia Fire Chief in Colonial Costume and, at Right, Early Piece of Equipment before Independence Hall; Below, Water from Modern Apparatus Playing on the Building



Contrasting colonial fire-fighting methods with the modern way, the Philadelphia fire department recently "saved" Independence Hall in a demonstration of the progress that has been made since revolutionary days. Garbed as old-time volunteers, a company of firemen equipped with hand pumpers and other ancient apparatus responded to an alarm sounded by town criers with rattles. After they had shown how a blaze would have been extinguished at the birth of the republic, six pieces of modern equipment responded to an alarm and demonstrated how a blaze today would be handled. Independence Hall has long been under the special care of the fire department, and yearly drills are held so no time would be lost if fire ever threatened the structure.



## "SHARE-EXPENSE" MOTOR TRIPS OFTEN FRAUDULENT

Recent police investigations in several cities have disclosed that the "share-expense" method of making automobile trips—once the device of thrifty motorists and travelers alike—has been developed by unscrupulous persons into a clever scheme

for defrauding passengers who attempt to save money by sharing expenses of an auto journey to their destination. The methods used by irresponsible drivers are different from those of a reputable travel-bookings agency and usually are easy to detect. The "wildcatter" ordinarily buys an old model of an expensive make of car for a small sum, sets up his own travel agency and solicits business. The unwary customer pays this agency a small sum for the booking and receives a receipt, but is required to surrender the receipt to the

Los Angeles Times

9/25/02



B1664 Peters & Russell

POPULAR MECHANICS

895

driver and pay the balance of the sum agreed upon when it comes time to start. This procedure should serve as a warning to the passenger because it leaves him at the mercy of the driver. There is further evidence of dishonesty if the driver warns his passengers to inform any inquiring officials that they are merely friends and not passengers and are only sharing the expense of the journey. Often persons expecting to make a leisurely trip in an expensive car find themselves crowded into an ancient vehicle with six or seven others. Sometimes they pile out at a stop and return to find car, driver and their money gone. The use of an old car and a long trip without rest or sleep combine to cause accidents and here again the passengers are out of luck. They find the driver has no insurance and nothing on which to levy, even if they could prove they had paid for transportation. Another trick of the unscrupulous driver is to see that the car breaks down soon after starting and, on one pretext or another, to delay repairs until his fares seek other means of making the trip. They have no receipt for money paid and he refuses to refund.

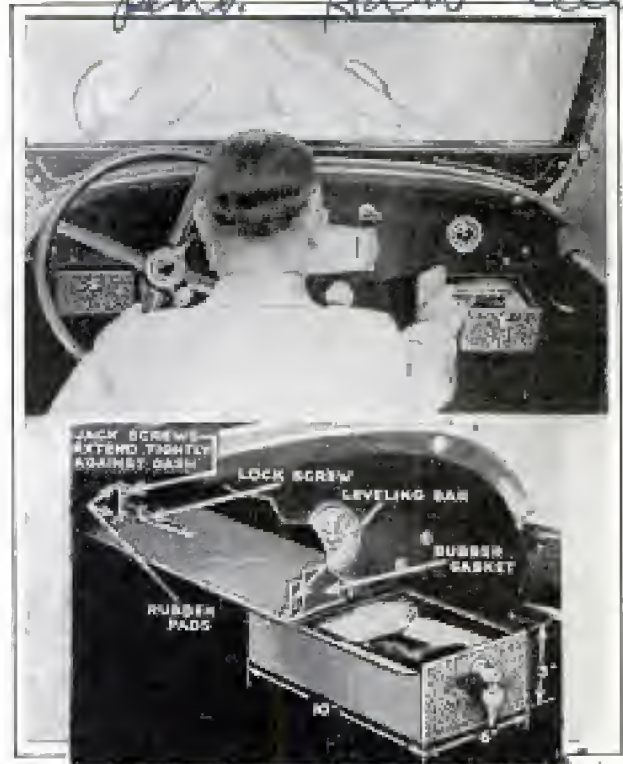
B1669  
**ELASTIC DRESSING FOR WOUND  
REQUIRES NO FASTENING**

Offering no interference with the movements of an injured member, an elastic dressing for wounds is being produced which requires no tying or pinning since it adheres to itself although it will not stick to skin, gauze or hair. Because it will stretch and is porous, it gives the wound an opportunity to "breathe" and thus aids in healing it.



**ELASTIC DRESSING.**  
Refer to Surgical Dressings, Inc.,  
65 Brookside Ave., Boston, Mass.

Springfield Ohio  
**PARCEL LOCKER FOR ALL CARS  
ATTACHES UNDER DASH**  
para. Dan Lee



Installation of Safe-Deposit Drawer Which Is Adjustable to Fit Any Make of Car

Instrument-board locking compartments featured by many of the latest cars, now are available to all motorists as an easily attached accessory. Adjustable to fit any make of car, this safe-deposit drawer fits under the dash and has rubber pads to prevent squeaks and rattles. When the sliding drawer is locked, it is completely inclosed and the attaching fixtures are inaccessible, thus making it theft-proof.

**COLD-STORAGE PHOTO PLATES  
MAKE BETTER PICTURES**

Like eggs and sausages, photographic plates are being kept in refrigerators to preserve their quality and uniformity. Tests have shown that this treatment applies particularly to plates intended for astronomical purposes, and several large observatories already have adopted the practice of keeping all unexposed plates on ice. The lower the temperature, the wly do changes in the emulsion more uniform in performance. e, and the result is that those kept more uniform in performance. tes exposed to a variety of temperatures.

Recommended by Dr.  
C. E. K. Mees, Director

Laboratory of Q. Rockefeller, N.Y.  
Eastall & Co. Rochester, N.Y.

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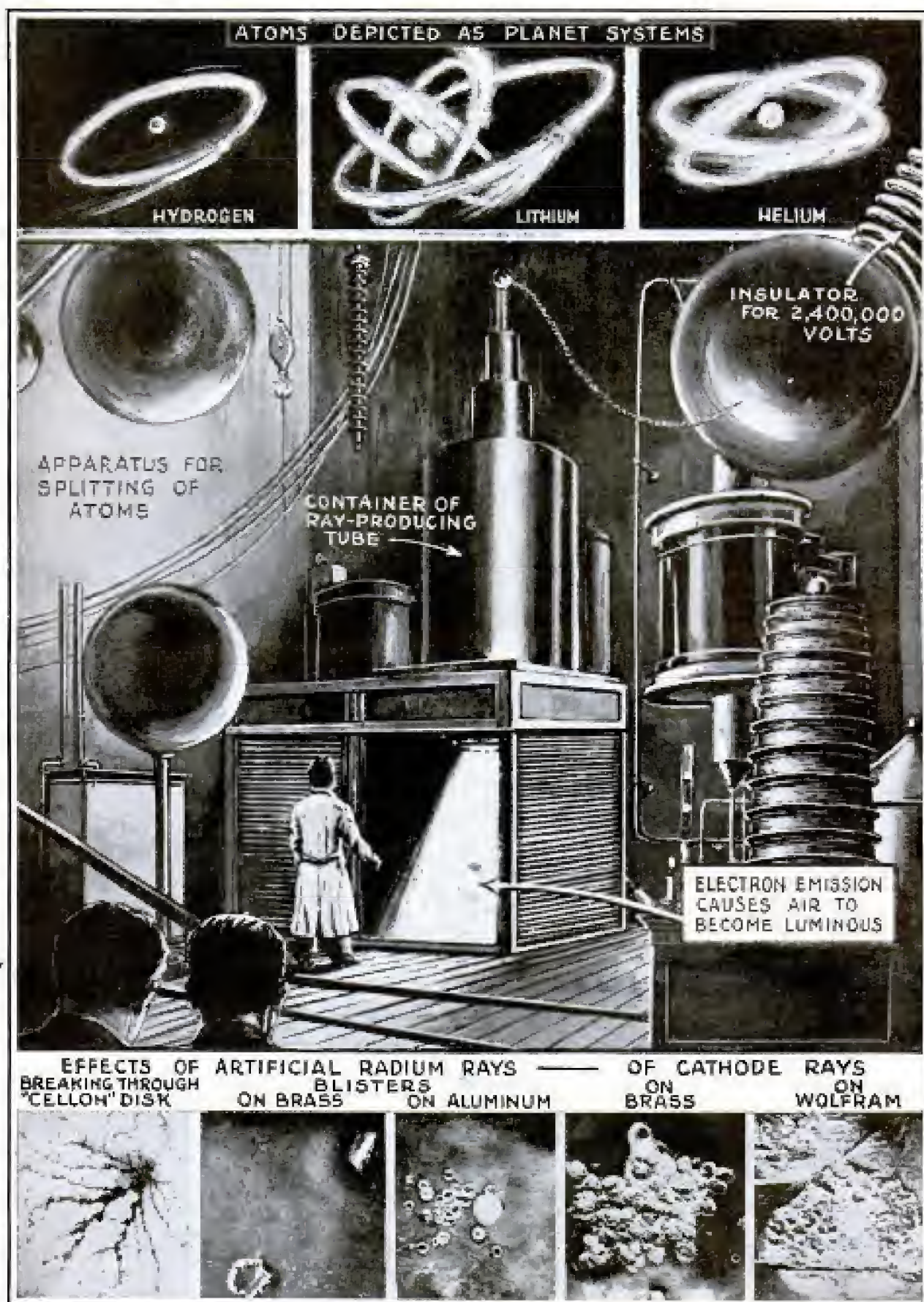


B1660

896

Carl. K. H. Runze Heydstrasse 13  
 Berlin W. 10, Germany  
 POPULAR MECHANICS

# Splitting Atoms with Artificial Radium Rays



Apparatus in Center Is Used by German Scientists to Split Atoms without Employing Radium by Shooting Helium or Hydrogen Electrons at Low Voltage against Material to Be Disintegrated

Heydstrasse 13,  
 Berlin W. 10, Germany

rev of front



Research Laboratory A. E. Es.  
(General Electric Co.)

Cmt. Wilkins

POPULAR MECHANICS

897

Akerschneide, Germany  
ATOMS SPLIT IN VACUUM TUBE  
WITH BOTTLED ENERGY B/660

Two German scientists, Dr. Lange and Dr. Brach, have succeeded in splitting atoms by employing artificial radium rays. The procedure includes shooting helium or hydrogen electron streams of great velocity at comparatively low voltages against the material to be disintegrated. By this method they have disintegrated the elements lithium, beryllium, borium, sodium and aluminum, which have light atoms, and also lead, which is of high atomic weight. The energy of radium itself could not be used because enough of the element is not available, but its various rays, alpha, beta and gamma, were created artificially by sending an electric current of very small amperage through a vacuum tube containing helium or hydrogen gas, the electronic velocity being considerably increased by using voltages from 500,000 to 2,400,000. The same men previously attempted to collect atmospheric electricity of 8,000,000 to 10,000,000 volts with an installation extending between two peaks in the Alps, and at present another apparatus is being built which they hope will put at their disposal from 7,000,000 to 10,000,000 volts.

B/627

### EXPANDING FEEDER FOR CHICKS GROWS TO FIT THE FLOCK

Telescoping feeders, which expand to twice the unit length to fit any-size flock of chickens or contract to suit any space in the poultry house, are now being offered. The legs are adjustable so the feeder adapts itself to an uneven floor. There is also a telescoping feeder for baby chicks which has legs to raise the feeder from the floor level to eight inches above it.



Telescoping Feeder for Chickens Can Be Expanded to Twice Its Length

Patd 7/29/32  
J. W. Esch, H. Parker,  
c/o Swift & Co.  
Hiawatha, Kans.



Motor Coach with Rounded Front Corner, Which Deflects Air and Keeps Dust and Dirt Out of Bus

### "FISH GILLS" FOR MOTOR COACH KEEP OUT ROAD DUST

Dust is stopped from blowing into a motor coach, or is sucked out if it does enter, by a method of construction suggested by the gills of the naturally streamlined fish. The gill effect is obtained by a rounded front corner on one side of the body which causes deflection of the air currents around the bus entrance at the front of the vehicle. Even when the sliding door is open, the dust is sucked out of, rather than drawn into, the coach.

### SAFETY BELT FOR SWIMMERS FILLS ITSELF WITH GAS B/640

Swimmers in Germany are wearing life belts which can be filled with gas in an instant in an emergency, but which are not in the way when unneeded. The belt consists of a closed tubular piece of cotton material which is fairly gas-tight when wet. Under ordinary conditions it hampers the swimmer no more than an ordinary belt would. If he gets into difficulties, he presses a lever which breaks a glass capsule filled with a carbonate compound which effervesces when wet, evolving carbon dioxide. This gas fills the belt and transforms it into an effective float to keep the wearer's head above water until help arrives.

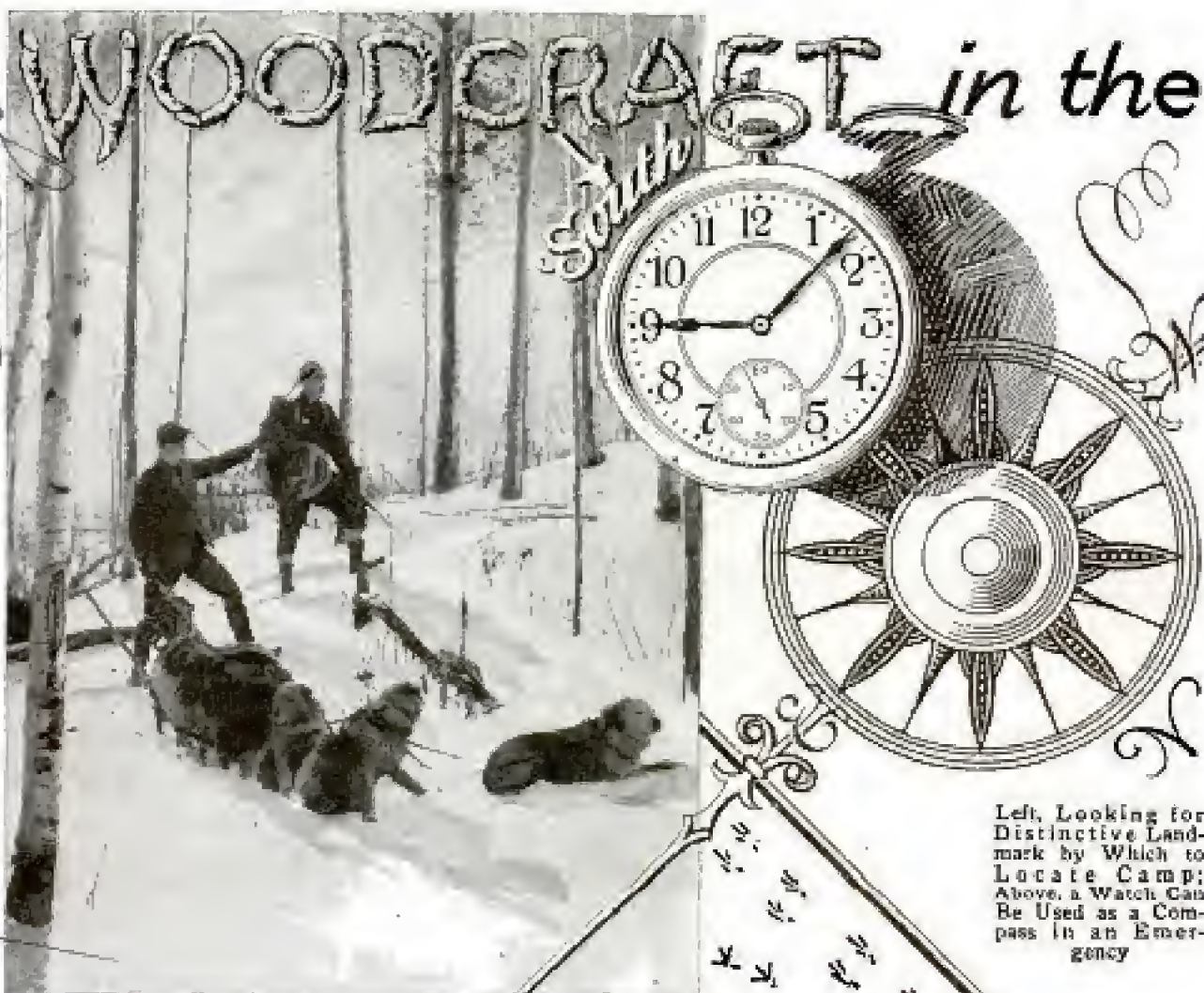
Berlin inventor cannot locate maker

Short Bros. Seaplane Works, England  
no U.S. agent known



B/468

points deep. Try to square them



Left, Looking for Distinctive Landmark by Which to Locate Camp; Above, a Watch Can Be Used as a Compass in an Emergency

By **BOB BECKER**  
c/o Chicago Tribune

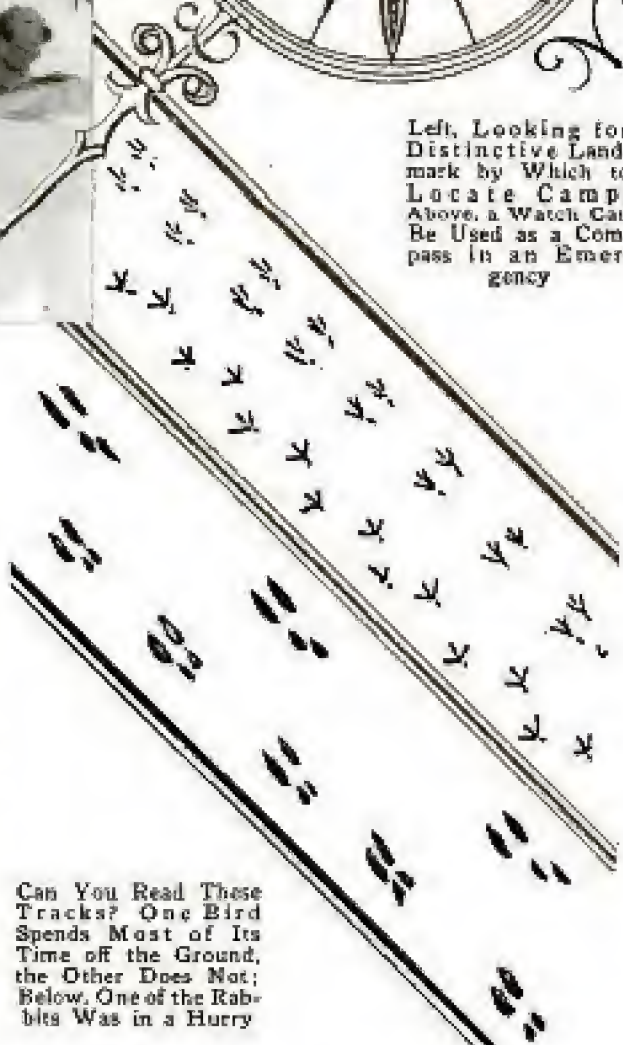
**WOODCRAFT** is simply the ability to read some of the guideposts of nature so that you can secure the maximum of comfort while close to nature.

Here are some of the most interesting tricks.

You are in the woods without a compass and the sun is obscured by the clouds. You think you can walk toward camp but you must have something to tell you which way north is in order to do it. Can you determine the points of the compass by looking at the moss on trees? Yes, you can.

First, remember that moss favors the side of a tree that retains moisture the longest.

So in finding your direction ignore leaning trees and the rough buttressed bases of big trees, because they usually grow moss all around their bases. Don't inspect



Can You Read These Tracks? One Bird Spends Most of Its Time off the Ground, the Other Does Not; Below, One of the Rabbits Was in a Hurry

trees which get no direct sunlight. Instead, pick trees which are isolated enough to get direct sunlight for a good portion



# WOODS

of the day, because they have a chance to lose moisture; those which stand at the edge of a big tract of timber or in an opening, because these evaporate much of their moisture; smooth-barked rather than rough-barked trees, because on these there is usually a fairly even deposit of moisture all around, and this moisture will evaporate least from the north and northeast sides.

What's the result? Walking along checking the trees, the traveler trying to read the moss-compass signs may look at 100 or more trees and not take the evidence of more than ten or fifteen. This small number can

Below, Peeling Birch Bark—Ideal Material to Start a Fire in Any Weather

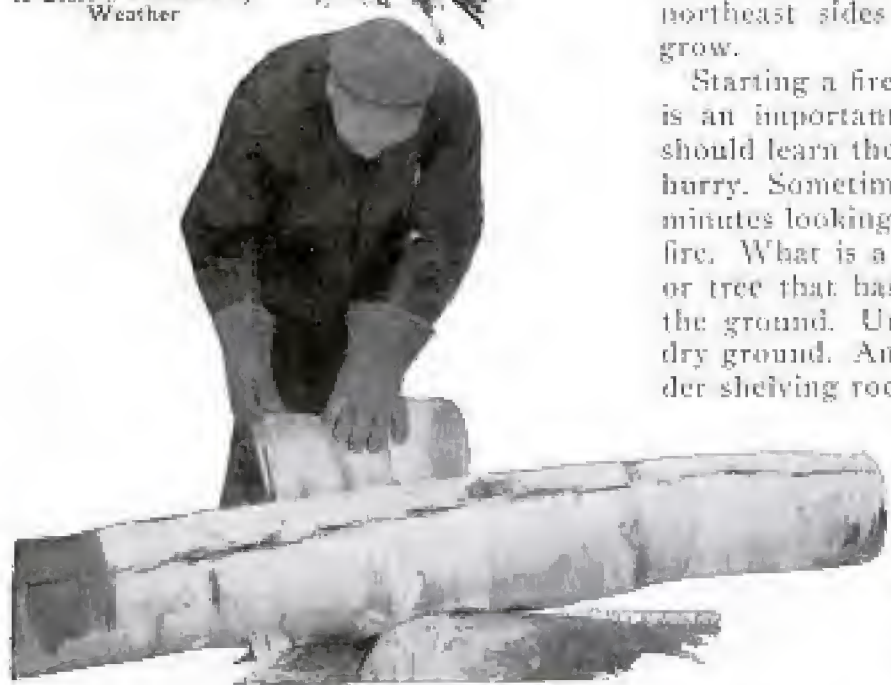


Moss on This Rough-Barked Tree Will Not Aid Lost Traveler Because It Grows All around the Trunk

tain the most moisture on their north and northeast sides and on these moss will grow.

Starting a fire in the rain or wet woods is an important stunt and every novice should learn the trick. First, don't be in a hurry. Sometimes I have had to spend ten minutes looking for a suitable spot for the fire. What is a suitable spot? A big log or tree that has fallen but is not flat on the ground. Under such logs you'll find dry ground. Another ideal location is under shelving rocks or similar natural shelter. Sometimes I have had to take an ax and tear apart an old punky stump. It would be dry in the heart and here the blaze could be started.

The next question is fuel. That will vary in different places. Birch bark stands first. Gather all you can and shred it. In the pine country you can get



give him the information he wants, namely, that trees with sufficient exposure re-





small pieces of "fat" pine and shave them down into thin slivers. Sometimes I have had to find an old leaning cedar and collect some of the dry bark from the underside.

Lacking any of these, take any softwood tree that has started to topple over and work on the under, dry side for bark and dry wood, using your belt knife. Sometimes I have had to work on the inside of a partly hollow and decaying tree to get enough dry stuff to start a blaze. Take it easy and have everything in your favor before a match is struck.

Incidentally, here is a tip on lighting matches when you have no dry spot to strike them. Put the head of the match between your teeth and then jerk it forward, quickly. It'll ignite.

Starting a fire without a match? In the north country the novice has no business leaving camp without his waterproof match box, small ax or knife and his compass. But often a hunter is caught without any of them. He is wet and cold. A fire is almost a necessity. But how can it be started without matches. This brings up

another woodcraft trick. If you have a shotgun and a few shells you can start a fire quite easily.

First, get everything ready for your blaze. Build up your fuel in wigwam shape, using thin, dry sticks. When you're ready, open a shotgun shell and pour out all except a few grains of the powder on the tinder. Tear a small piece of cotton cloth from your clothing and stuff it loosely into the nearly empty shell. Point the gun straight into the air and fire. The cloth wadding will come down near you, and it will be glowing so that, by blowing on it, you can humor it into a blaze. Drop it on your pile, and the fire is started.



Above, Following Blazed Trail; Below, Rubbing Bone against Tree to Imitate Moose Scraping Horns

Although the city man may think of the north woods area as a trackless forest primeval without a single marker to help the novice woodsman, there are several kinds of "street signs" to be read if he knows how and where to look for them. This brings us to the subject of tree blazes.

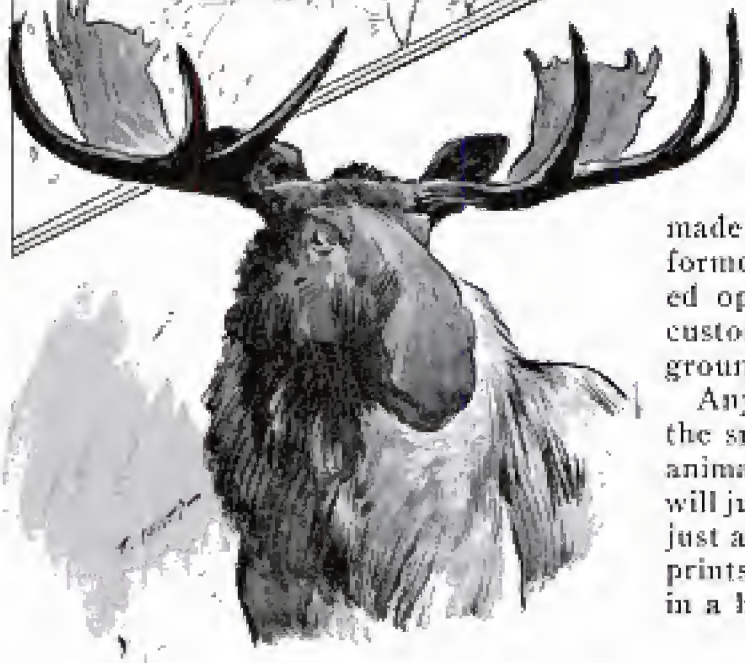
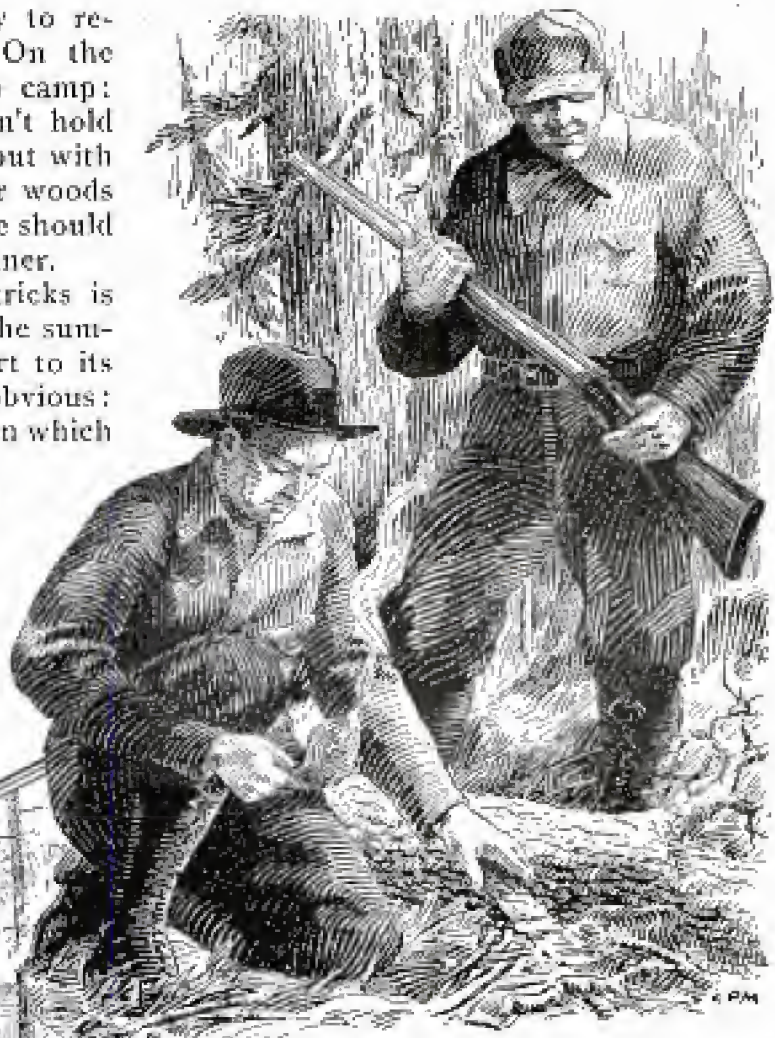
A blaze is a durable and quite conspicuous cut on the bark of a tree. The first thing to remember about a tree blaze is that an experienced camper usually cuts one blaze on a trail that leads him away



from his permanent camp. Easy to remember this: A blaze—a-way. On the other hand, two blazes means to camp: Two blazes—to camp. This doesn't hold true of trails blazed by trappers, but with the average sportsman, camper or woods traveler it does prevail. The novice should blaze his trails in the one-two manner.

Although learning woodcraft tricks is great sport in the woods during the summer, winter really brings the sport to its culmen. The reason is quite obvious: Snow in the woods is like a book on which all the animals and birds of the forest write their names and the record of their behavior. As illustrations of what winter woodcraft in the woods means and by way of showing how much fun it can be, consider the following problems:

There are tracks of birds in the snow. Can you tell if it is a ground



Above, Using Gun to Start a Fire; Left, Bull Moose with Spreading Horns Left Trail Because He Could Not Pass between the Two Trees

bird or one accustomed to spending its life in the trees?

A rabbit track is identified. Is he in a hurry or just loafing along?

What is the very small track that leads to and from an old bird's nest?

It is not so very difficult to tell the difference between a ground and tree bird after the two have made a record for you in the snow. The former walks with the two feet not planted opposite each other. The bird unaccustomed to spending much time on the ground naturally hops.

Any novice can identify a rabbit trail in the snow, but how can he learn what the animal is doing? A rabbit taking it easy will just hop along leaving four foot marks just a few inches apart. When these foot-prints are several feet apart Mr. Rabbit is in a hurry.

(Continued to page 140A)



B1659 Patent Electric Co

902

POPULAR MECHANICS

91. 7th Ave New York

# Beautifying Voices for Radio Broadcasting

Emk. Henry Clay Foster, 233 W. 77 St. New York



Above, Operating Sound Compensator to Correct Singer's Voice; Right, Instrument That Improves Voices

Persons speaking over the radio may now have their voices beautified without losing any pleasing natural characteristics by means of a special instrument known as a "compensator." Radio amplifier tubes are used in the apparatus, hooked up to feed into and be fed by special resonant and "rejector" circuits. The compensator is similar in appearance to a radio-receiving set without the cabinet and speaker, and by moving the dials one can reinforce or diminish the output in the lower or higher frequencies of the speaker's voice. Thus those having weak, harsh or raucous voices may have them retouched so that the maximum effectiveness for the ear is realized. Not only can a voice be made more attractive to listeners, but sometimes a convincing quality can be added by using filters to eliminate unwanted frequencies and compensators for building up the others. Each voice contains high and low frequencies, but some are more prominent than others, thus lending individuality to each voice. The compensator improves singing voices likewise and can make orchestral numbers more effective by providing greater richness of tone than could be heard in the same room with the orchestra. Heretofore it has been the aim of radio transmission to give as lifelike a



reproduction of the voice and music as possible, but now it has been found that the radio, and other electrically transmitted sound devices, are much kinder to some high-voiced individuals than to other deep-voiced persons. With the compensator, it is possible for the radio speaker to have a "prescription" or dial-setting table made out for his individual voice, so that it can be set at once to bring out the best qualities. It is also claimed that a speaker's voice could be made to sound in New England as though he had a Yankee twang, in the south as if he had a southern drawl, and in the west as though he spoke with the crisp accent common there.

## RUBBER GRIPS WINDOW PANES IN PLACE OF PUTTY

B1642

Replacing putty, strips of rubber are being used to fasten panes of glass in windows. A steel rod imbedded in the strips gives rigidity. Small metal triangles hold the strips in place. Installation is said to be simple, and the strips may be used a second time if a window is broken.

U. S. Rubber Co.  
2 Market St.  
Passaic, N. J.

Copyrighted material



*(East River Mfg. Co.)*  
*South Whittier, Cal.*

B/688

POPULAR MECHANICS

903

*Protecto-Cote*  
**RUST AND FIREPROOF  
COATING FOR AUTO  
EXHAUST PIPES**

*Dist. National Mill Safely Co.*  
*Columbia St. Port Wayne, Cal.*  
*359 4*  
Fire, water and rust-proof, a new liquid coating has been found adapted to use on automobile exhaust manifolds, pipes and mufflers, providing a protection heretofore believed impossible. The liquid, applied with brush or spray gun, dries into a hard coating that resists heat up to 3,300 degrees without chipping or flaking. After being brought to white heat, it returns to its original color. Usually, the exhaust system is left unpainted, but if painted, a week's operation of the car burns off all the finish, leaving manifold, exhaust pipes and muffler to rust. The new coating prevents this. The liquid also is useful on stoves, furnaces, radiators and other surfaces subject to high heat, and action of water and acid. Wall board, or wood treated with the liquid, withstood, in tests, the heat of a blowtorch until the substances underneath the paint dissolved or disintegrated.

**FIRE TRUCK HAS SNOWPLOW  
TO CLEAR AWAY DRIFTS**

*Austria*  
Having chain and endless-tread wheels and a snowplow, a Vienna fire truck cuts its way through drifts to fires. It also clears a path through the snow for other trucks. The truck, with attached plow, was built especially for use in storms.



When Snow Is Deep, This Engine Plows Its Way to Scene of Fire in Vienna



Fisherman Making a Cast at Wheel-Like Target; Unusual Skill Is Necessary in Placing the Fly on the "Bull's-Eye"

**FLY-CASTING AT LAND TARGETS  
TESTS FISHING SKILL**

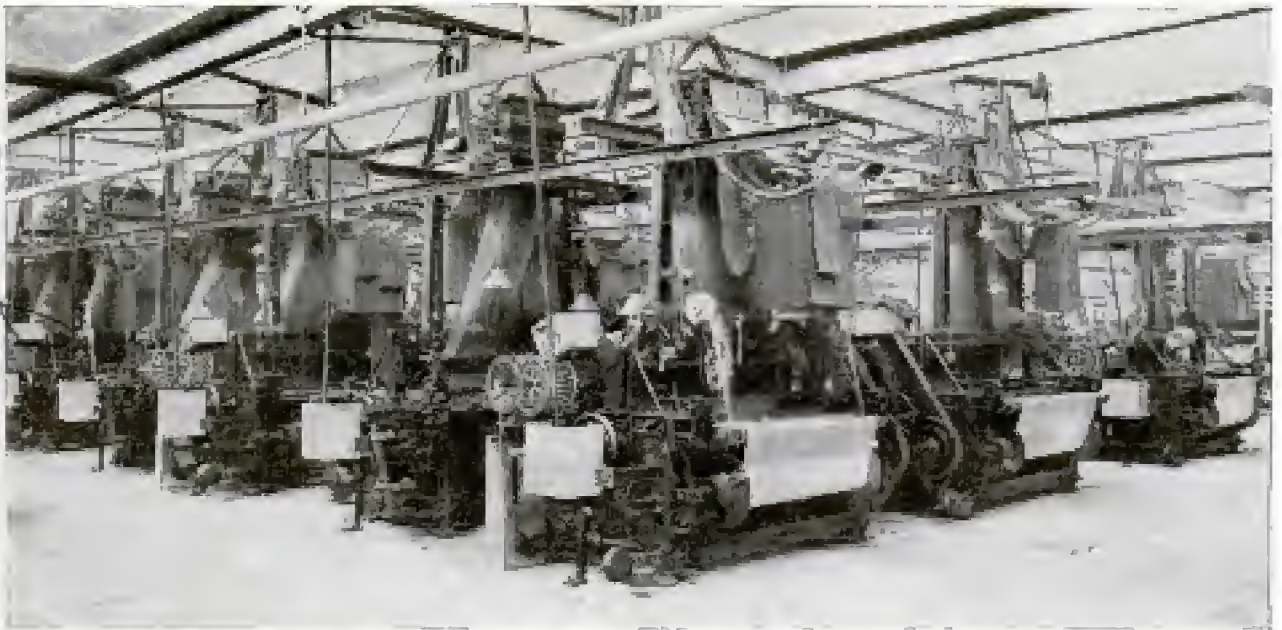
By fly-casting at targets on dry land, perhaps miles from water, German sportsmen practice or test their skill in tournaments. These targets take various forms, but all test the long casting ability as well as the accuracy of the angler. One target is circular and mounted on a post. In the center is a solid disk at which the fly is aimed. Then there are rings around this disk with space between, providing a test of varying degrees of accuracy. Another target is a piece of cloth on which the bull's-eye and surrounding rings are painted. The cloth is stretched on the ground. Small lead disks of the approximate weight of the ordinary casting bait, are used instead of flies. Casts of 165 to 170 feet have been recorded in many of the tournaments.

Our Bureau of Information is for your benefit. Use it as often as you please.

*Elie Wache 9/10/32 R 11/9*



## Creaseless Cotton and Silk Ends Long Search



Weaving Silk on Looms in a Manchester Mill; a Solution of Resin Is Added to the Fabric, Converting Cotton or Artificial Silk into a Material Which Will Not Crease

It has taken a band of scientists near Manchester, England, fourteen years' of researches and an expenditure of about \$350,000 to find a solution of the problem how to make artificial silk and cotton fabrics, which will not crease after wear, or rot after washing and cleaning, the latter defect being that of rayon. Dr. R. S. Willows was in charge of the work. Cotton lint, from which cotton yarn is spun, is made of thousands upon thousands of fine hairs, about one inch long, and a few ten-thousandths of an inch in diameter. Look at the dyed hairs under a microscope, and you will see that the color penetrates the whole of the hair, showing that it is not solid throughout, but simply spongy.

"What does this mean?" said Doctor Willows. "It means that the fabric as a whole is not springy and elastic, and that if you crease the material, the folds will not 'come out.' To get rid of the tendency to crease, one has to make each individual cotton fiber, or hair, elastic. This is the problem in a nutshell. When we began our researches, the only way to overcome the tendency to crease was to add twist to the yarn, but that addition increased the cost, and the resultant fabric, a kind of crepe, was still very far behind wool in non-creasing properties.

"Time after time," said Doctor Willows,

"we failed, but there is no problem in science and industry, which cannot be solved, given enough time, money and patience. Rubber is a substance which could be 'pumped' into the spongy silk and cotton hairs to make them elastic, but that is not a practical solution. We turned to the new school of chemists who have devised resins out of coal tar. Bakelite is one of them. Again we met failure, for we could not find the right sort of resin. At last, however, we succeeded and our process for making the 'total anti-crease solution,' as it is called, is to press the resin solution into the fabric and then convert it into an elastic resin by heating to a high temperature. This synthetic condensation product goes into the spongy cotton and silk hairs and filaments, just like a dye into cloth, and makes the fabric, either cotton or artificial silk, or rayon, like wool in not creasing. It also adds to the weight of the material, and, as it is cheaper than cotton, and the method of applying it is not expensive, it can be used for a variety of fabrics, including cotton, artificial silk, shoddy and linen.

"It is well known that when certain goods, made from artificial silk, are washed, they often prove to be rotten. This process prevents that danger, and is a final one, applied after the goods are bleached, dyed or printed."

similar product will be put on market in 1933  
by Pacific Mills, 274 Church St. New York



## EXTREMES IN NATURE APPLIED TO NEEDS OF MANKIND

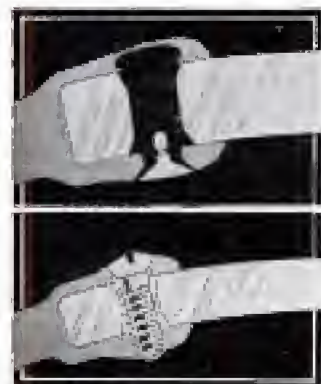
Extremes in nature, including all the things to which the superlative can be applied, not only stir the imagination but knowledge concerning them often aids in selecting the best materials to serve mankind in specific ways. Dr. B. S. Hopkins, of the University of Illinois, has compiled a list of some of these extremes, including the heaviest substance known, which is osmium, with a density varying from 21.3 to twenty-four. The lightest substance is hydrogen gas, unless we consider highly evacuated X-ray tubes containing streams of electrons, which are fragments of disrupted hydrogen atoms. The hardest material is the diamond, and the most ductile and malleable metal is gold. The highest temperatures sustained and measured with reasonable accuracy are in the neighborhood of 3,500 or 3,800 degrees Centigrade, and the most extreme cold ever recorded is the melting point of solid helium, 272.3 degrees Centigrade below zero which is within seven-tenths of a degree of absolute zero, the theoretical point where all heat vanishes. The most costly substance known to commerce is radium which sells at a price corresponding to more than \$2,000,000 per troy ounce.

## EYEGLASSES ARE KEPT TIGHT BY PLASTIC RIVET

Replacing the screw for mounting rimless eyeglasses, a plastic rivet that seals the lens and strap into a unit has been introduced. The rivet is packed tight into the lens hole after being softened at a

temperature of 200 degrees. Then it hardens into a permanent mounting that eliminates much danger of lens breakage. Under old methods, the screw fits so poorly into the drilled lens that it either is too tight and cracks the lens

or so loose the lens wobbles. A machine for installing the rivet does the job in less time than if a screw is used.



Bausch & Lomb Optical Co. Rochester, N.Y.



Filling in Dents in Auto Body with Metal Is Made Easy with New Spray Gun

## METAL SPRAY GUN FOR AUTOS SPEEDS UP REPAIRS

Speeding up repairs to auto body and fenders, a spray gun for applying metal has been devised. The gun, which sells at a low price, is practical for spraying solder filler on dents or wherever filler is required. As much as two pounds of metal per minute can be applied. The gun operates from an acetylene tank and compressed-air line and is portable. It is said to save forty per cent in time and labor, sixty per cent in acetylene and ten per cent in solder, while it eliminates heat warpage, acid corrosion, removal of upholstery and trim and the use of expensive body solders. The solder is applied cool, that is, the heat never exceeds 225 degrees Fahrenheit, which is not hot enough to damage metal joints or to warp thin panels.

## "CELLULOID" FROM WOOD PULP

Highly resistant to water, a new material made from wood pulp is similar to celluloid, though much stronger in tests. The product is to be used in the manufacture of toys, buoys for fish nets and life belts and other things.

produced at Frederikstad Norway. reported by Trade Commissioner, Vladimir Carlson Oslo, Norway

Taken on by Metallurgical Syndicate Box 111, Long Island City, N.Y.

9/14/32 To Dept. of Commerce



1459 Cmt. Boyden Sparks  
199 Puntan Ave.  
Forest Hills Gardens N.Y. New York

# How to BECOME

*Brown's Physical Training Camps  
Bronxville Learning on Hudson  
New York*



By FORREST HILL

**B**ILL BROWN, the trainer, has known more champions, I guess, than any man alive—champions of all kinds, fighters, wrestlers, runners, weight lifters, scullers, swimmers, jumpers, tennis players, golfers, jockeys and others.

In his lifetime he has trained many outstanding athletes; most of the good ones he has seen in action, and in his youth as a wrestler he went to the mat with some of the world's best. Bill Brown, if anyone does, knows what it takes to become a champion.

"Hey, Bill," I asked him recently, "what about Gene Tunney? He says in the story of his life that he just made up his mind he was going to be the heavyweight champion and then—well, he made good all right. How about it? Can anybody make himself a champion?"



Top, Champion Soccer Players from India Training for Match; Below, Akse Garvinan, Swedish Decathlon Champion, on the Practice Field

"Well," said Bill, "I'll tell you..." But his answer took the best part of a week to deliver. Some of it I got while hiking beside him over the roads in the hills where long ago he established his training farm,



3 1459

# a CHAMPION

at Garrison, in the South Highlands of the Hudson, opposite West Point Military Academy. An occasional young athlete is trained nowadays by Bill Brown, but most of those he trains are lawyers, statesmen, army officers, clergymen, merchants, journalists, actors and manufacturers. In training these men, and their sons, Bill Brown uses the same technique as if his charges were trying to become champions. He never, therefore, permits any of them to do too much.

"Many a champion has been pulled off his perch," Bill told me one morning on a hike, "because he left his fight out on the road. Road work should be regarded as of first importance in the conditioning of any man. We are all of us only as good as our legs. Yet road work can be overdone. With a sound heart, almost any man ought to be capable of six or eight miles of road



Top, Chuhei Nambu, Japanese Hop, Step and Jump Champion; Center, Georgia Coleman, Diving Champion; Below, Helene Madison, Swimmer

work. I don't mean running. For ordinary men trying to improve their condition, I mean walking uphill and down. For athletes, I mean walking with intervals of sprinting. In any kind of an athletic contest you need spurts of energy. So, when an athlete trains, he ought to vary his road work, walk fast, then run, slow down for a breather and then run again.

"You remember that legendary hero who began by lifting and carrying a calf? As it grew, his





strength increased, and when the calf had become a full-grown bull the man's strength was equal to the job. How many people, when they see Babe Ruth swat a ball over the fence, see as well the years of practice that gave him the timing sense that makes him the home-run king? How many, when they think of all the money Gene Tunney earned in the ring, think also of the hours of drudgery he had to devote to the task of making himself good enough to whip Jack Dempsey?

"You know why you get that road work every morning?" Bill asked. "For the same reason Tunney got it, and Dempsey and Jeffries and Corbett. Every time you go out on the road you increase your endurance. Each day we send you a little farther and you find yourself doing a longer hike more easily than you did a short one at the beginning of your training. The man who is conditioned with road work has a good foundation. His legs are right.

You've heard of glass jaws? It's nonsense. Generally it's a fighter's knees and not his jaw that crumple under a blow. When your legs refuse to work, you're out; so is a champ, even when his name is Dempsey."

At breakfast one morning, Bill commented on the Olympic contests then being held at Los Angeles.

"All those winners must have power to endure," he said. "Muscles, bones, nerves, heart, lungs—these are the things sports writers talk about and measure when they estimate the chances

Above, William Graber, of University of Southern California, Setting World's Record for Pole Vault; Below, William Carr of American Relay Team, Receiving Baton in Olympic-Game Event



of human contestants or race horses. But none of these is as important as quickness of reaction, that is speed—and the power to endure. And endurance is the stuff of which champions are made. It means more than muscle power. It means mental power—guts—gameness.

"The gamest man I have ever known is my best friend, George Bothner. Without a doubt Bothner is the gamest man who ever worked on a wrestling mat. You know he was for a long time lightweight champion of the world; but he would wrestle anyone. When he weighed around 130 pounds, he thought nothing of taking on men who weighed 225 or 250 pounds. He didn't know the meaning of the word quit. In 1906, Bothner



Above, Thomas Hampson, of Great Britain, winning 800-Meter Race at Los Angeles Olympics; Left, American Horseman practicing jumps for Olympic Contests.

leg. The pain was no doubt excruciating.

"'Nix!' said George.

"'Quit or I'll break your leg,' threatened Link.

"'Go ahead and break it!' Bothner was a champion all right. Shad Link bore down with all his might and the bones of Bothner's leg snapped. When he was unconscious, Link rolled him over on his back. But bones knit, and for many years thereafter Bothner continued to be the world's lightweight wrestling champion. His heart was right. On the other hand, there was George Hackenschmidt, the big Russian wrestler.

"When Hack first came to this country I trained him. Before that I had trained Tom Jenkins who was the heavyweight wrestling champion. When they met at

(Continued to page 136A)

had himself matched out of his class with a fellow nearly twice his size named Shad Link. They wrestled at Atlantic City. The big fellow finally got a toe hold on Bothner.

"'Roll over,' commanded Link. He was exerting a terrific leverage on Bothner's



031601



Fireman Is Shown Practicing Direction of the Nozzle from Top of Hose Ladder at a Height of About Eight Stories

### FIREMEN PRACTICE ON LADDER EIGHTY-FIVE FEET TALL

Just to keep in practice, firemen of one large American city go to school, handling equipment used only in big fires and climbing tall ladders. One eighty-five-foot ladder carries hose and fireman high above the city streets to demonstrate what might be expected if a skyscraper caught fire.

### CROPS PRODUCED UNDER GLASS ON THOUSANDS OF ACRES

Farming under glass is increasing so rapidly in England that more than 3,000 acres of land are said to be producing crops by artificial methods. The biggest crops are cauliflower, marrows, lettuce, potatoes, asparagus, carrots, beans, turnips, strawberries, tomatoes, cucumbers and grapes. Farming under glass is expensive, one firm with twenty-four acres

in use burning 4,500 tons of coal per year and employing 300 men. But on the other hand, the crops command higher prices. To keep the rich soil free from pests, sterilizing is necessary. Portable boilers produce steam which is forced through the soil, destroying insects. There are chemicals that can be mixed with the soil to kill pests, but that do not injure plants. Many small growers specialize growing tomatoes in the early part of the year and chrysanthemums for the winter market. All conditions of cultivation can be controlled by the glass-house farmer, temperature, moisture and fertilization being maintained at any desired level. England's investment in this method of farming is said to be close to \$40,000,000, while the wages paid exceed \$4,000,000.

controlled by the glass-house farmer, temperature, moisture and fertilization being maintained at any desired level. England's investment in this method of farming is said to be close to \$40,000,000, while the wages paid exceed \$4,000,000.

031605

### FLASHLIGHT AIDS WORK WITH SCREWDRIVER

By building a flashlight into the handle of a screwdriver, a tool has been produced which enables the mechanic to use both hands effectively when working in dark corners. The light is controlled by a button in the end of the handle and, when turned on, directly illuminates the screw head. The handle is of vulcanized rubber, and hence the tool is particularly adapted to electrical work.



Screwdriver with Flashlight in Handle to Illuminate Work; Button in Handle Controls Light

Burgess Battery Co  
272 Park St. Boston, Mass.

St Louis, Mo.

031610

Answers 9/10/32



01573

see Jan 1931-92

POPULAR MECHANICS

911

# Treasure of Sunken Liner Sought by Divers



*Hard Liner*  
By Using a Special Diving Observation Chamber Accommodating Four Persons, Attempts Are Being Made to Recover \$4,000,000 in Gold and Silver Bullion from the Treasure Ship "Merida," Which for Thirteen Years Has Rested in 300-Feet of Water Sixty Miles off the Virginia Capes: Above, at Left, a Deep-Sea Diver Entering the Observation Chamber, and at Right, Capt. Harry L. Bowdoin, Inventor of the Chamber, Aboard the Salvage Ship "Salvor," Holding a Piece of Deck Railing Covered with Barnacles and Other Deep-Sea Growths Which Was Brought by Grapnels from the "Merida"; Below, Right, Diving Chamber Being Lowered from the Ship

*Whitestone, L. I. New York*

*Wide World*

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International Assoc.

912

POPULAR MECHANICS

Hydrographic Office  
Secretary of Navy  
Washington D.C.

Municipal  
Electricians  
in St. Louis

Can not locate  
maker or inventor



Fire Alarm with a Handcuff, Which Holds Person Turning in an Alarm Until Fire Department Arrives

### HANDCUFF ON FIRE-ALARM BOX STOPS FALSE REPORTS

Fire-alarm boxes that handcuff all persons operating them have been tested as a means of preventing false alarms. A person turning in a report must insert an arm in the underside of the box and turn a key. This causes a cuff to clamp about the wrist as the alarm is relayed. Since the clamp can only be removed with a special key in possession of the firemen, the operator is securely held until the fire department reaches the box and releases him.

### FIVE NUMBERS ARE TOO MANY IN AUTO-LICENSE TAGS

More than four figures on an automobile license plate make it impossible to catch the numbers of speeding cars. Dr. James L. Graham, of Lehigh University, reached this conclusion after conducting tests with an apparatus containing a reducing lens which changed the apparent distance, thus making it possible to test in the laboratory the ability to read tags rapidly fading into the distance. With three-number plates in black letters on a white ground, ninety-four per cent were seen correctly, but only nine per cent of seven-number tags were legible, and but sixty-four per cent of five-number plates could be read, although the speed used in the laboratory was only a third to a fifth of usual road speeds. Bright reflecting sur-

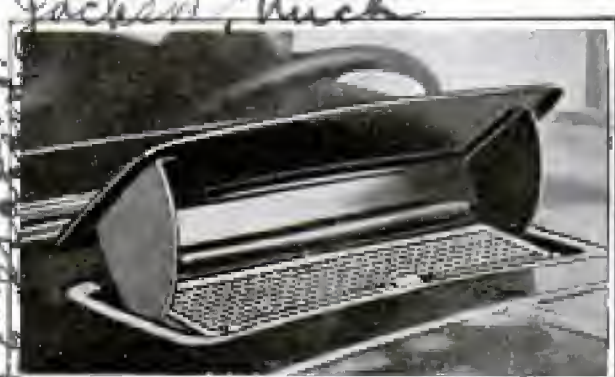
faces greatly reduced legibility, and color also was found to be important. When illuminated only by the tail light, blue on an orange background was found about thirty per cent better than the same colors reversed.

### HOLE IN BOTTOM OF THE OCEAN NEARLY SEVEN MILES DEEP

Recent listing of the deepest "deeps" in the Atlantic and Pacific oceans shows the greatest known depth is in the latter—the Mindanao deep, 35,400 feet, near the Philippine islands. Other soundings of more than 30,000 feet have been made in several places in the western part of the north Pacific, and in the south Pacific, the deepest known point is Aldrich deep, 30,930 feet, north of New Zealand. The Atlantic cannot boast such depths. The deepest sounding known in the north Atlantic is Nares deep, about 27,972 feet, in West Indian waters. In the south Atlantic a sounding of 26,575 feet was recorded east of the southern tip of South America. The other oceans have much lesser depths, ranging from 14,000 to 22,000 feet.

### SCREEN FOR AUTO VENTILATOR KEEPS BEES OUT OF CAR

To prevent the entrance of bees and other insects into an automobile through the cowl ventilator, a screen is being of-



Screen for Cowl Ventilator on Car Prevents Bees and Other Insects from Entering

ferred. It is installed simply by placing the unit in the opening and tightening one setscrew. Many insects, it has been found, are sucked into the car through the cowl opening, and bees in particular often cause accidents by distracting the attention of the driver.

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Science News Letter  
9/24/32

Bethlehem, Pa

Science News Letter 9/24/32

Science News Letter 9/24/32

James L. Graham

Hyerson



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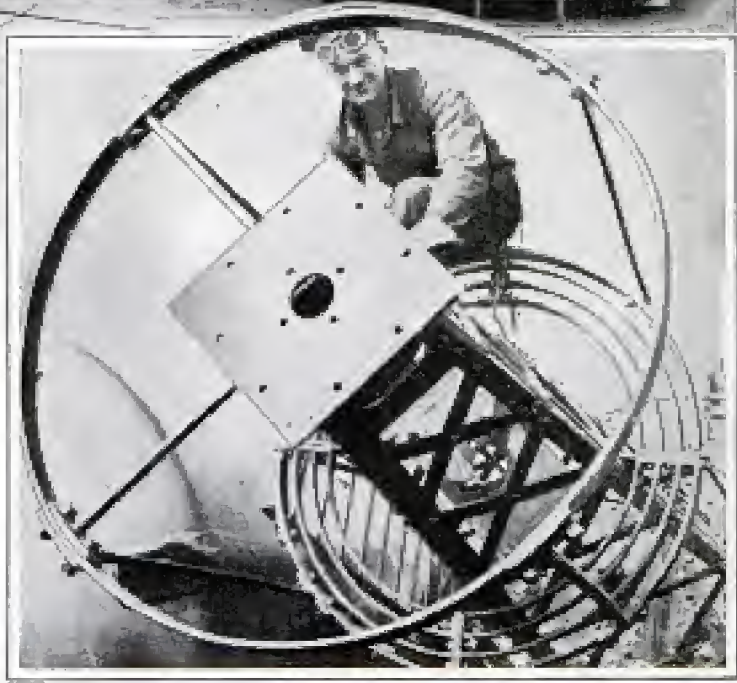
at Blackwall  
East India, England

# How Ships at Sea Are Safeguarded by Buoys



Under Water

Above, Types of British Buoys at the Repair Shop; Right, Overhauling Ten-Ton Buoy, One of Largest in Use



At present the United States lighthouse service maintains about 10,100 buoys as aids to navigation, although not all of them are stationed in the open sea. The average life of a metal buoy is twenty years, and a wooden one lasts five years but must be brought in frequently for repairs. The total number of aids to navigation maintained by the service on June 30, 1932, was 21,294, an increase of more than 1,000 since last year.

There are 1,607 airway beacons, and 129 radio ranges and radio marker beacons for airway use. The first airway beacon was established in 1927.

## CLOCK WITH NO DIAL OR HANDS SHOWS HOUR AND MINUTE

Time reading has been so greatly simplified in an electric clock without dial or hands that any child who can distinguish figures can tell the correct time to a minute at a glance. Instead of the usual dial and the hour and minute hands, there is a small slot in the front in which the figures representing the time appear like the mileage reading on the



speedometer of an automobile. The figures on the clock change every sixty seconds, and a glance at such a timepiece shows only the hour and minute at that particular moment. The cases are modernistic in design, the motors require no adjustments or oiling, and there are fewer mechanical parts than have previously been used for electric clocks.

## SEALS HELP FIND OYSTER BEDS

Seals are to be used to locate oyster and lobster beds in James bay, the lower arm of Hudson bay. The plan of employing seals as oyster detectives was adopted after northern trappers had reported that seals caught in James bay often contain both lobsters and oysters. By following them, it is expected fishermen will find the beds without making a search of the entire bay.

Antarctic government  
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100-120 U. 60.50.25 cycle

B1671

B1699

(Montagne)

Winwood Clock Co.  
Winwood Station  
Pittsburgh, Pa.



B/653 Cont. *Chas. E. Stinson Jr.*  
145 S. S. Spring St  
Los Angeles, Calif

# FIRE DETECTIVES



Fire Detective Timing Candles of Different Thicknesses for Data to Break Down Alibis

**T**WO men in plain clothes prowled through the still smoking ruins of what an hour before had been a pretentious building. One of them stooped to pick up a piece of charred wood, while the other carefully transferred to a paper some fluffy ash which the wind already was scattering. These and other pieces of debris were collected and carried to a laboratory where trained members of the city's arson squad subjected them to a microscopic third degree. Late that same night, one of the investigators flew to a city 500 miles away where the owner of the building, on a pleasure trip, was preparing to return home.

"I've just heard about the fire," he exclaimed when the investigator introduced himself. "It's a mystery to me."



Two Photomicrographs of Charred Surface of Pine Plank Which Reveal Agent Used to Carry Flames



In the Upper Photograph, Linseed Oil Was Burned on the Pine, as Indicated by the Higher and More Uniform Ridges, and in the Lower, Kerosene Was Used to Spread the Flames



# MAKE ASHES TALK

"How did it start?" he asked.

"You know, because you did it," was the reply.

"What do you mean?" demanded the owner. "That fire happened this morning and I've been out of town since yesterday afternoon."

"I'll tell you," replied the investigator. "This



Top, Comparing Photomicrographs of Rabbit and Fox Skins; Below, Candle Wick and Trail of Papers Which Convicted One Arsonist

morning you were out playing golf and at 11 o'clock you went to the clubhouse to make a phone call. You called your store, and as no one was there, you listened until the bell had rung fourteen times. Then you hung up and resumed your game.

"The bell clapper of the phone in your office was tied down with a weak string that you had learned would break on fourteen rings. Just before you hung up, the clapper broke loose and struck a nail that

discharged a blank cartridge that you had fastened in a wooden block. The flare from the cartridge ignited five gallons of gasoline in a glass bottle, the bottle broke under the heat, and the flaming gasoline spread over the floor and burned up your insured merchandise. Come along with me."

This really happened. Professional fire bugs and their amateur imitators have developed new and ingenious ways of creating fires in the last few years.

But members of an arson squad today can ransack the charred timbers of a fire and tell you if it is an arson case, the sex and nationality of the criminal, the method used to start the fire, and the minute of its inception.

Paul T. Wolfe, chief of the fire-investigation bureau in Los Angeles,







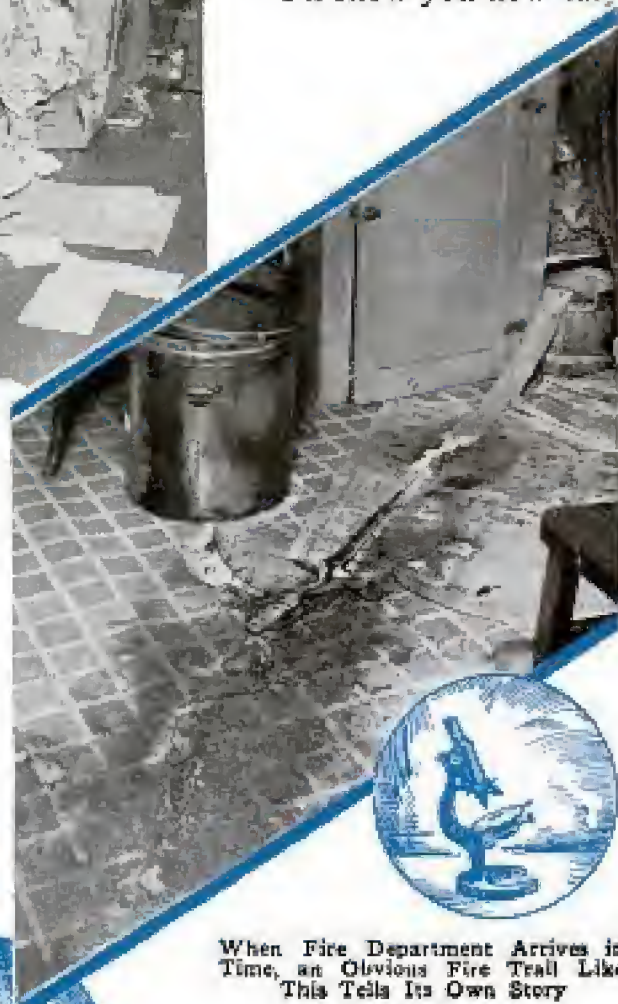
A Simple Candle Device for Starting a Fire That Was Found Before It Had Chance to Work

who is turning arson detection into an exact science, has some amazing cases in his records. "A few years ago," he says, "a man in New York started a fire in his Los Angeles office merely by calling his number on the long-distance phone. Only recently a fire occurred in a building ten months after the owner had locked it up and left for Europe. His timing device went off almost at the hour he had calculated. More recently still, a fire bug was able to burn down a house he had never been near simply by driving down the adjoining street."

Ten years ago, mechanical contrivances such as clock-works were frequently used to start fires, but the twisted bits of metal remaining were so hard to explain away, that incendiaries have adopted more subtle methods. Inflammable liquids,

gases, chemicals, and electricity, coupled with starting devices that practically disintegrate in the flames, are the latest tools of the professional "torch." The arson squad has only one weapon, the microscope, but this is proving to be more than a match for the criminal. The microscope is a practically infallible instrument of detection.

"I'll show you how easy



When Fire Department Arrives in Time, an Obvious Fire Trail Like This Tells Its Own Story



it is," says Mr. Wolfe. "When I go out to investigate a suspicious fire, I first locate the spot where the fire started. You can do this by tracing the cross checks on the burned wood. When wood burns normally, the







Investigators Examining a Collection of Various Devices for Getting a Fire under Way

cross checks on the charcoal have a definite size, but the checks are finer and closer together if some material that burns with a hotter flame than wood is present. We take a small piece of charcoal and make a photomicrograph of its surface. Then we compare this with photographs from the files and that tells us the material or liquid that set the wood on fire.

"Every combustible liquid leaves its own telltale marks on the wood. For example, if turpentine is burned on pine, the photomicrograph shows long rough ridges with cross cracks. If it was linseed oil, the ridges are higher and more uniform. A rough plane without cross cracks indicates that alcohol was used. If the plane

is smoother, but with cracks, kerosene was employed, and if the plane is smooth and with large cracks, then gasoline was the agent that carried the fire.

"A typical trick in the past was to carry heavy insurance on a stock of expensive goods," says Mr. Wolfe. "Then the fire bug would move the goods out, substitute shoddy material in their place, and start a fire. In that way he could obtain the insurance money and still own the goods. But that is no longer popular, even with fragile furs and feathers. The microscope enables us to differentiate between the burned hair and skin of an expensive fur and its charred counterfeit."

Newspaper stories that begin with the





words, "A fire of unknown origin last night destroyed..." are now open to revision, Mr. Wolfe explained, as the exact cause of a blaze can always be learned. With the recent improvements in detection methods, fewer fires are ascribed to such causes as spontaneous combustion or electrical short circuits. Not even the common story of the iron left standing on the ironing board is readily accepted now, for an innocent fire from that cause usually will burn itself out with little damage. A hot iron will consume the cloth and wood beneath it, but the fire rarely spreads beyond the range of the iron's heat, and the iron will eventually eat its way through the board and fall on the floor, disconnecting the cord.

The whole art of arson detection is based on the fact that practically every material burns at a different temperature. A gaso-

line flame, for instance, burns at 1,500 degrees Fahrenheit, while burning sugar creates a temperature of only 700 degrees. Each individual flame temperature leaves different microscopic marks on burned wood and on the remains of other burned materials. With a knowledge of the temperature table, and of the effects that each temperature creates, an investigator can tell at a glance exactly what material started a fire.

This knowledge has given the arson squad a direct lead on the fire bugs who employ chemicals to start a fire or to spread the flames. Each chemical leaves its own characteristic mark long after the fire has been extinguished. Even when a gas is used, its identity may be determined.

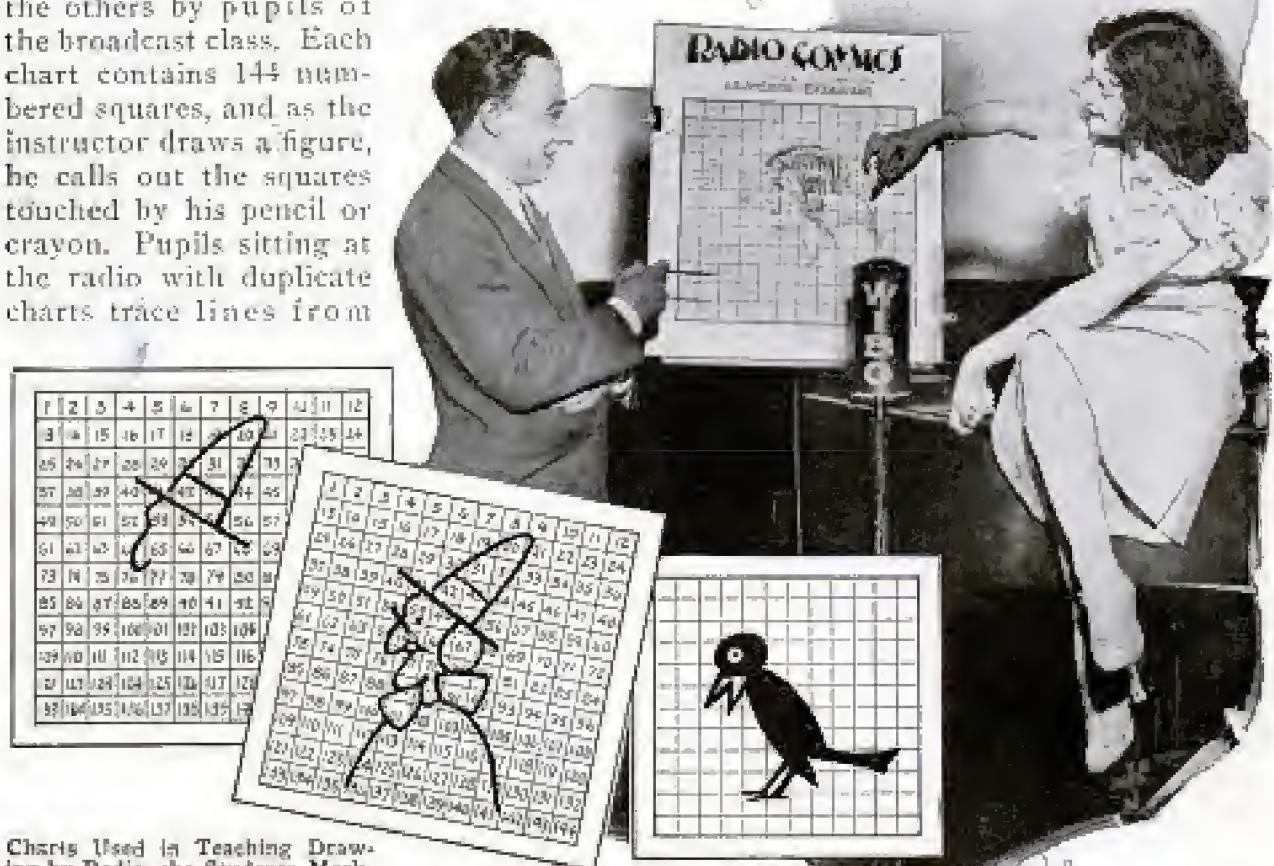
As a result, eighty-five per cent of arson suspects in Los Angeles in the last few years have been convicted.

### DRAWING IS TAUGHT BY RADIO WITH NUMBERED CHART

Drawing can now be taught by radio with the aid of duplicate numbered charts, one used by the artist or cartoonist instructor and the others by pupils of the broadcast class. Each chart contains 144 numbered squares, and as the instructor draws a figure, he calls out the squares touched by his pencil or crayon. Pupils sitting at the radio with duplicate charts trace lines from

one number to another as they are announced in efforts to "copy" the work of the instructor. By such methods, caricatures, birds, animals, flags and other objects can be reproduced by the novice.

*Talking Pencil*



Charts Used in Teaching Drawing by Radio, the Students Marking in Lines between Numbers

Rich Nichols, 157 E. Erie St. Chicago  
Left 30  
Ed. Whitehall 6490 (ad March 23 209)



B 1689

# Building World's Largest Stone Monument



Commemorating the decisive battle of the Marne, the world's greatest monument of stone has been constructed and dedicated in France. It was designed by Frederick Mac Monnies and built by Edmondo Quattrocchi, both American sculptors. Exact reproduction of the models executed by Mac Monnies

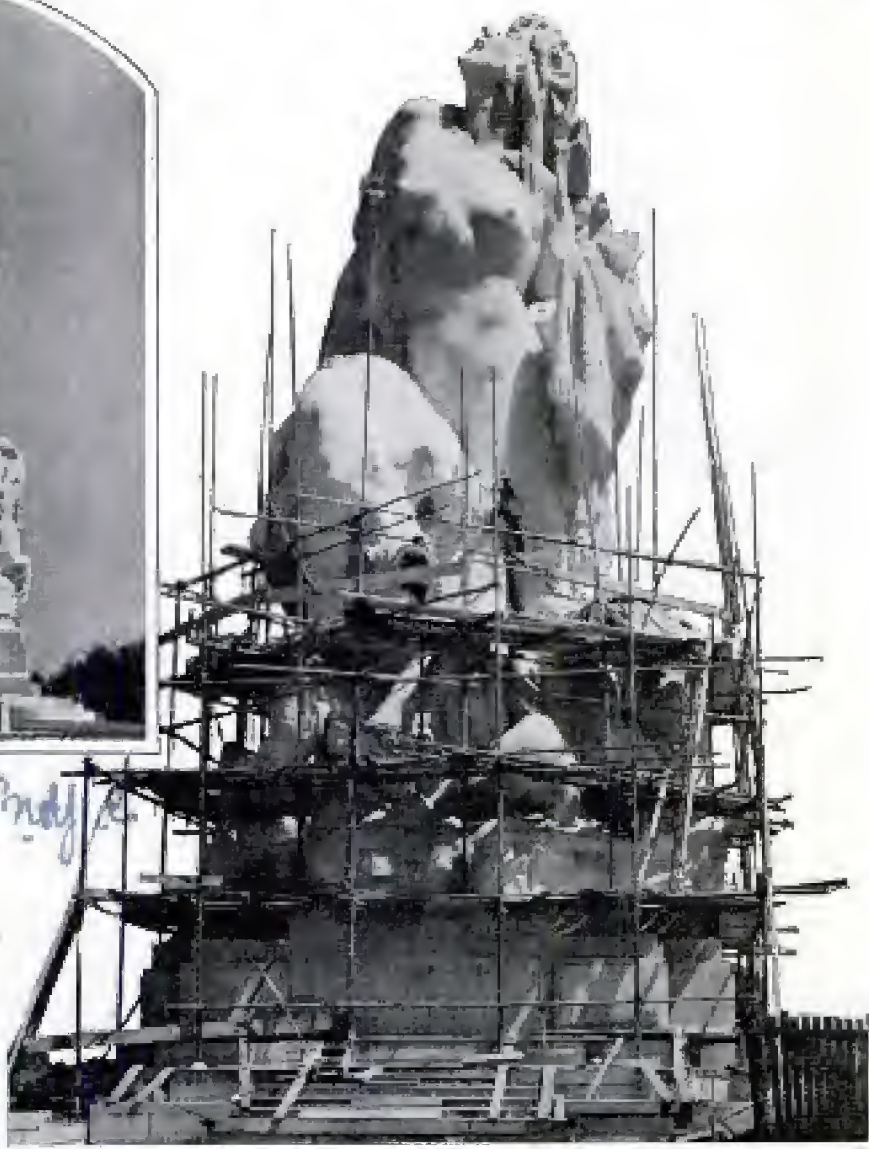


Photo at Left Shows Completed Monument to the Battle of the Marne; Right, Workmen Placing Giant Blocks of Stone

was made possible by a machine invented by Quattrocchi and used for the first time in constructing this monument. The machine sets points from plaster models onto stone with great speed and accuracy, so

that blocks executed and carved in the studio fit closely when placed in position. The monument is seventy-five feet high, equal to a seven-story building, while the central figure is sixty feet tall.

## FORTY-BILLION-VOLT ENERGY ESTIMATE FOR COSMIC RAY

That cosmic radiation bombards the earth with energies of forty billion volts is the latest estimate of Dr. Thomas H. Johnson, of the Franklin Institute, Swarthmore, Pa. This is about forty times the highest energies usually assigned to the cosmic ray. Doctor Johnson developed

the idea that the measured intensity of the radiation depends upon the particular kind of material through which the rays have just passed. This led to an estimate of the energy of each of the secondary radiations produced by one cosmic ray, or about 20,000,000,000 volts. Since these rays have passed through the atmosphere, dissipating energy as they traveled, he doubled this figure for rays entering it.

Assistant director Bartol Research Foundation

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More news service. 331 W. 14th Street

B 1668

More news service. 9/19/32



B1593 *Modern High Capacity Air*



Sectional Room Cooler Using Ice, Which Can Be Enlarged as Needed



### COOLER FOR ROOMS USES ICE AND ELECTRIC FAN

Built on the same principle as a sectional bookcase, an air cooler for office, store or home is provided with one, two or three sections, and can be expanded as conditions require. Each section will hold seventy-five pounds of ice, and each is provided with handles inside to facilitate recharging with ice or removing water. A base supports the ice fan and catches the condensed moisture of cooling, while the turret top contains the power unit and blower, which may be turned to shoot the breeze in any desired direction. There is also a louvre for vertical control.

### FOSSILS OF FOUR-LEGGED FISH FOUND IN GREENLAND

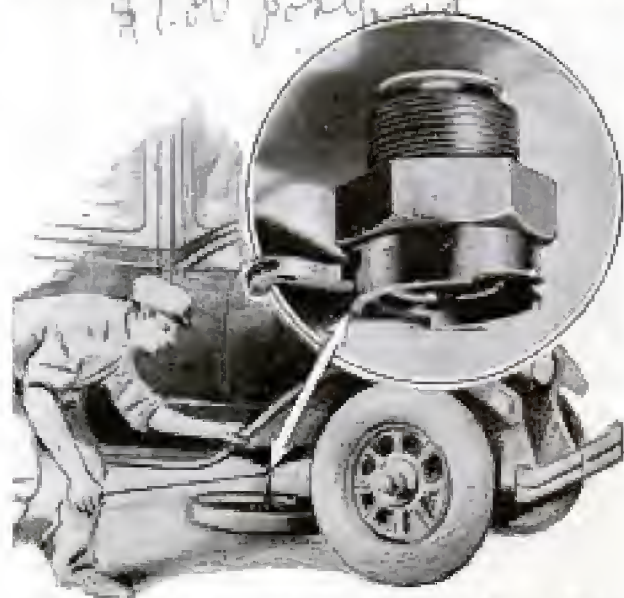
B1667 *Copenhagen Denmark*  
Fossils of "four-legged fish," regarded as the connecting link between water-dwelling and land-dwelling vertebrates, have been found in Greenland by Dr. Lauge Koch, Danish geologist. The fossils are among the exhibits with which Doctor Koch expects to reveal the complete scientific story of Greenland. The four-legged fish are known as Stegocephalians, not really fish but amphibians possessing a number of fishlike characteristics. They were the forerunners of the frog-toad-salamander family. There are, however, genuine fish that are four-legged,

that is, their fore and aft paired fins are modified in such a way that they can crawl as well as swim with them. Such fish are found as fossils among the earliest vertebrate-bearing rock strata, and two or three species of them still survive in the muddy rivers of the semiarid parts of Africa and Australia. These are known as lung fish, which get oxygen only by means of lungs or modified swim bladders. If kept under water for many hours, such a fish suffocates—literally drowns.

### REMOTE-CONTROL DRAIN PLUGS MAKE OIL CHANGES EASY

Crawling under an automobile to remove the drain plug when changing oil is unnecessary if the regular plug is replaced by one now offered that is opened and closed by remote control. The plug contains a valve under spring tension which is opened by a tug on a wire extending to any point conveniently in reach. A notched wire allows the operator to do other work while the car drains. The device is leak-proof and prevents forgetting to tighten the plug when the wire pull is released, as the action is automatic. As the plug closes, the torsional movement wipes the tapered seat, which prevents catching and retaining dirt in draining.

*\$1.00 each*



Oil-Drain Plug for Auto Operated by a Wire Which Opens a Valve Held under Spring Tension

Clearance is the same as for the original plug and the opening for draining is the same. There are six sizes to fit all makes of automobiles.

*June 1932*

*9/19/32*

*Copyrighted Material  
J. H. Woodruff & Co. Inc.  
Baltimore, Md.*



## Rocking on Water in a Rubber Bubble Boat

Resembling a flattened bubble or rubber drum, an inflated boat recently developed lends itself to many types of water sport. It is made in various forms, con-



Collapsible Rubber Boat Resembling an Inflated Auto Tube with a Double Cover; It Can Be Used as a Raft or Propelled by Rocking

sisting in its simplest form of a ring of stiff material covered on both sides with airtight balloon cloth, the result being much like an automobile tire fitted with a cover for both sides. One kind of stiffener is an aluminum-alloy ring with a U-shaped cross section, the concave side being outward. A rubber tube encircles the ring and, when inflated, flows out over the edges to provide a cushion. The whole is covered with a rubberized fabric laced in place and, finally, an outer covering of awning material. The two flat surfaces are held apart by air at low pressure. A collapsible boat has a stiffening ring of fabric-covered tubing that can be pumped to about fifty pounds' air pressure to make a rigid framework. Another type, intended for towing behind a motorboat, has a metal bottom, and a third, of all-metal construction, is for use on ice boats instead of regular runners so such craft can run both on ice and in water. For bathers, the inflated boats are superior to both blown-up inner tubes and swimming tubes, it is claimed, because a bather can



climb upon one of them and rest with his body entirely out of water. Such a craft can be used as a diving platform for shallow water also. While the boats can be propelled with a double-ended oar, they can also be "rocked"

from place to place, the operator resting his knees near the edge so the opposite edge is tilted. A rocking motion then causes the boat to travel forward. They have also been used for tilting contests and as surf boards. The inflated tube and section between covers give double protection from sinking. When deflated, craft can be carried under the arm.

### "HEAT WAVES" ONLY LIGHT

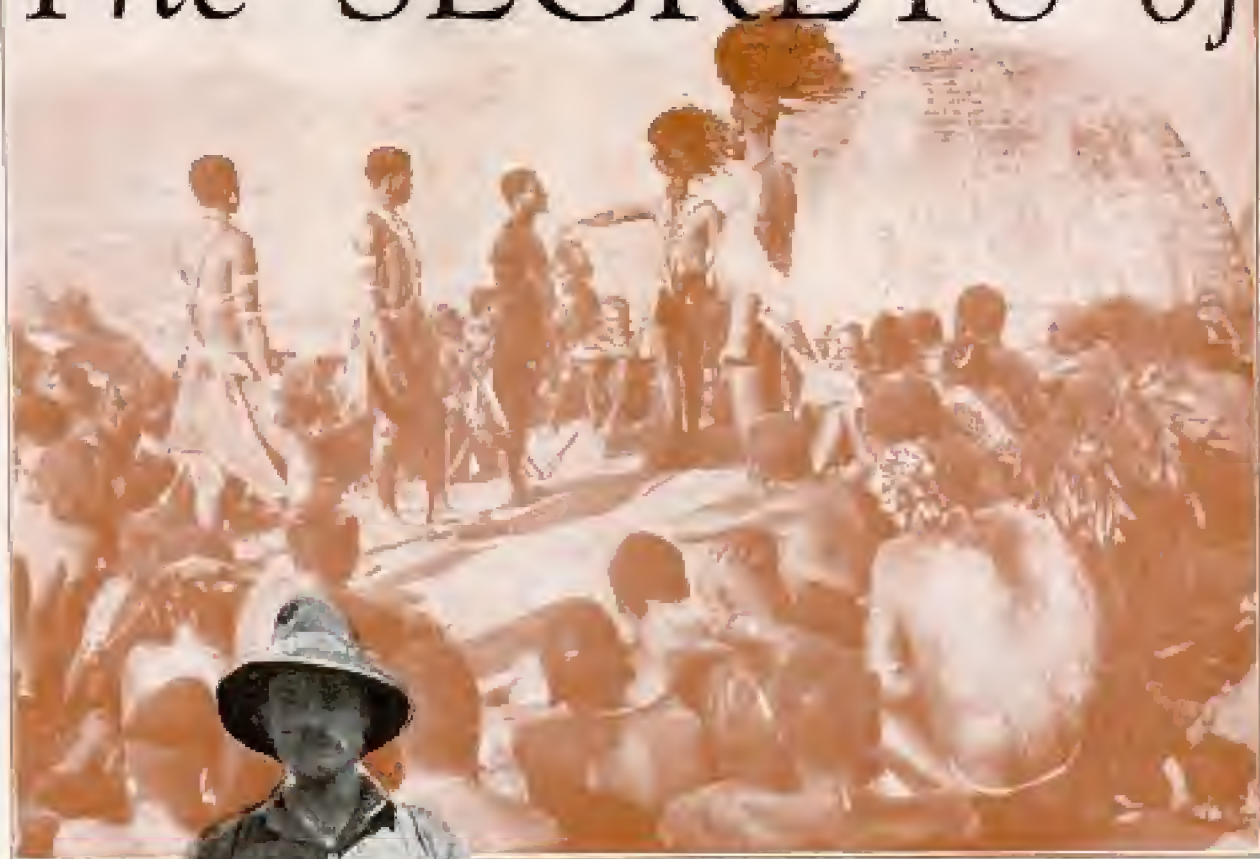
When wriggling waves are seen rising from a hot pavement in summer, the observer does not see heat radiating, as is generally believed. Instead he observes light refractions caused by currents of air of lighter density arising from the heated surface. The light waves are bent and the wriggling illusion results, just as a stick thrust into water appears bent. The twinkling of the stars and the mirage of the desert are other phenomena of refraction.

Wood impregnated with rubber is being used for some parts of violins.



B719 Cmt. 26 Clairouin  
90. Rue de Turenne.  
Paris VII, France

# The SECRETS of



By Attilio Gatti

**L**IONS were raging in the mountains of northern Zululand and fear spread in a paralyzing wave over the veldt. The Zulus gathered in the kraal of first one chief, then another, their worried gaze fastened on the emptying plain below, where zebras, gazelles and antelope moved southward in search of more plentiful pasturage and water.

In the kraals women and girls, old men and even children were silent with the fear of impending calamity. Each day the chief of each kraal gathered his family about him and, holding a calabash of water over his head, solemnly let it fall drop by drop on the parched ground. This, so the rain god, if absent-minded at the moment, might be left in no doubt of what was wanted.

The Zulus did not fear the drouth itself because the mountains are rich in springs. But



Above, Tribe of Zulus, Most Courageous of African Natives, Engaged in One of Their Ceremonials; Below, the Author and Lion He Killed



# the LION MEN

when the dry weather drives all game from the plains, the lion, having no more food, thinks of the taste of human blood. Then he becomes a terror, and there is no safety for women who work in the sweet-potato gardens, girls who go to the springs for water, boys who take the cattle to pasture, or old men and children who stray from their huts.

I was encamped on a hill with my native boys, the African kraals of the Zulus all about. The Zulus do not live in villages, but each family establishes its own settlement, or kraal, composed of clean and well-built huts placed in a circle around a fenced space in which the cattle are kept. The biggest hut is for the chief, each of the others being occupied by a wife and her children. A chief of-



Above, Native Zulu Warrior in One of His Tribal Ceremonies;  
Below, Cats Like This Strike Terror to Zulu Hearts

ten has as many as ten wives and, next to his cattle, he cherishes his wives as evidence of his wealth and power, for he buys his wives at so many cows per wife, so each wife actually represents a certain number of cattle.

For days the Zulus, abandoned by their rain god, had been preparing to defend themselves. Old people and children built

a thick fence of thorn-covered branches, the women collected huge stores of sweet potatoes and meal, warriors sharpened spears and tested their shields. The cattle were pastured close to the inclosures so they might be driven in at the first alarm.

Then, one night, the tempest broke with a terrifying and majestic orchestral effect like a thousand thunderstorms. A long, far-away roar began the concert and was answered by ten, forty, a hundred challenges that seemed to fill all space. The lions were attacking in force. The first burst of noise was followed by a momentary silence even more terrifying. It was as if the beasts had held a preliminary roll call.

My native "boys"—some old enough to





Above, the Witch Doctor of a Zulu Tribe, Ready to Chase Lions or Bring Rain, Whichever Is Needed Most at the Moment; Below, Commander Gatti's Party Bugged Down in the Veldt

have been my grandfather—surrounded me with mouthings of devotion and reiterations that the white man and his gun would not let them perish. At the first sound, I had rushed from my quarters with my rifle, but was almost as much awed by the racket as my natives.

Suddenly the uncanny silence was punctuated by the "tam-ta-ta-tam-ta-ta" of a tom-tom. It was picked up at once by other drums and soon the beats seemed to be coming from everywhere. This was the

marvelous acoustic telegraph of the natives going into action. It is the best method of the Zulu for communicating messages over great distances and appears to be as rapid as our own telegraph.

Messages flew back and forth until suddenly all but one drum were stilled. This tom-tom, my boy said, beat out a message that the lions were attacking the kraal. The message was hardly relayed when word was passed that the attack had been repulsed. False alarms, requests to "stand by," and other messages, were followed by news of a second attack, this time aimed at the kraal of my friend, Chief Xipooso.

Drums repeated the message, but soon came the rhythmic beats informing us that this attack, likewise, had been repulsed. There is a belief among the Zulus that lions never attack the same kraal twice in the same night, so when the drums began their beat again, there was great excitement among my boys for they heard that

the beasts had massed about Xipooso's kraal for a second assault.

Then, as my boys interpreted the beating of twenty drums taking up the refrain, my blood ran cold at the message. "One lion jumped the fence, entered a hut, seized one of the chief's wives and, with another jump, took her over the fence," they translated. "The chief had only time to wound the lion with an arrow before it disappeared, clutching its prey in its jaws. The other lions have tasted human blood



and are terrible. If help is not sent, tomorrow morning will find that Xipooso and all his wives and all his sons have been devoured."

I understood the situation probably was exaggerated, but it was nonetheless terrifying. The night was dark, the distance great and the way treacherous, but Xipooso had once saved my life. I decided to try to help him. "Tell him," I told my interpreter, "that we will arrive as soon as possible." Now our own drum called for silence, and soon it was hammering out its message to harassed Xipooso, the beats being passed along as the signals were given.

With my rifle in my hand, a bandoleer of cartridges about my waist and a focusing electric lamp attached to my forehead, I was ready to start. My gun bearer followed with a reserve rifle and ten picked boys carried torches. Running, stumbling and falling up and down those endless hills, we seemed to be struggling in a treadmill. We avoided the dangerous thickets as best we could, but twice the glare of my light reflected a pair of big phosphorescent eyes. Both times, with a roar, the lion disappeared before I could hypnotize him with the light long enough to take aim.

Little by little, we approached Xipooso's kraal, and the night was made hideous by human cries and shrieks, the roar of lions and the terrified bellowing of cattle. Evidently men, women and children were trying to make as much noise as possible to frighten the beasts away, but the lions were infuriated instead of scared. At last we arrived at the top of the hill overlooking the kraal, and a scene met our eyes which seemed to spell disaster.

The big fence of thorny branches about the inclosure had caught fire from brands thrown at the lions and was burning furiously. For the moment, the humans inside were safe because the lions feared the fire ring far more than the thorny fence, but when the fire died out, Xipooso, his wives and children were at the mercy of the jungle cats. I fired twice in the air, lighted my headlamp and dashed down the hill toward the inclosure, followed by my frightened boys. We saw no lions and were soon inside, my boys parting the

(Continued to page 116A)

Combination Chair and Easel That Can Be Carried under Arm When Folded



### COMBINATION CHAIR AND EASEL IS CONVENIENT FOR ARTIST

Artists can now go on landscape-painting trips without loading themselves down with equipment by using a combination chair and easel which folds into such a compact unit that it can be carried under the arm. The various pins, grooves and notches make it easy to adjust the combination to the most convenient position for any sort of work, and the equipment is light in weight.

### RUBBER COVER FOR DOORKNOBS PROTECTS THE WALLS

Rubber covers to fit any form of standard doorknobs are being provided to protect walls and also



to guard glass knobs and others likely to be broken by contact with walls or furniture. Similar covers are made to fit the valve wheels on steam radiators to protect the hands

when starting a sticking valve.

Dry ice is being used to shrink exhaust-valve seats into place in motor blocks.

General Motors Truck Co General Motors Bldg Detroit, Mich.

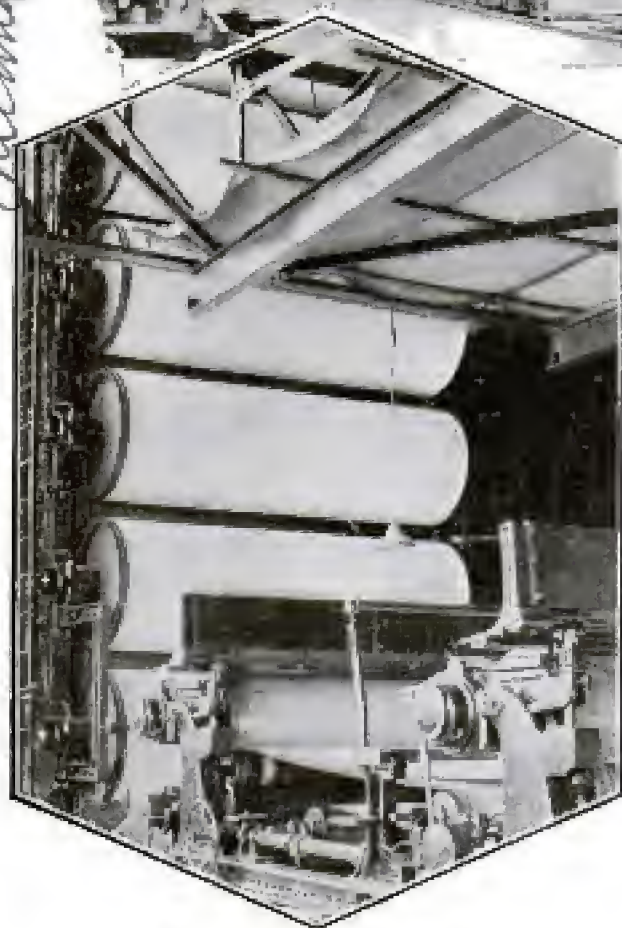
Woodward Clow

The Laurel Co  
 Springfield, N.J.



## Lumber-Mill Waste Is Turned to Rayon Silk

Above, Wood Waste at a Lumber Mill; Below, the Same Waste Coming from a Machine as a Pulp Base to Be Converted into Rayon or Cellophane; in Circle, Bale of Rayon Pulp



One of America's newest industries has proved a lifesaver for one Washington city, and efforts to find new uses for forest products have developed an ingenious

process for converting hemlock wood waste, heretofore dumped into the boiler rooms of sawmills, into a soft, snow-white and fluffy pulp suitable for conversion into rayon and cellophane. Long research has produced a process that takes ordinary cull hemlock waste from the mills and changes it, by a cooking bleaching operation, into fibers softer and stronger than cotton, and today one paper plant on Puget Sound is running twenty-four hours a day, keeping 300 workers busy seven days per week, turning out bales of pulp for shipment by steamer to the Atlantic coast for making cellophane sheets and rayon thread. For years a third of America's most splendid timber was burned up as a total loss, but declining volume of lumber manufacture has set the industry to working out new uses for waste, at a saving often greater, per 1,000 feet of logs used, than the original cost of the timber

Carl Charles J. A. Martin 1110 Puget Sound Bank Bldg  
Tacoma Wash



*Federal Railways*  
*Reported by Commercial*  
*Attache Charles E. Lyon*

## POPULAR MECHANICS

*Mess Geiss I koverhe*  
*Bresden*  
*Germany*  
*927*

standing in the woods. It is a far cry from hemlock trees to silk stockings or sheets of cellophane, but the pure cellulose base made from wood waste for over a year has kept the plant going full speed.

### DAY AND NIGHT TRAIN SIGNALS MORE VISIBLE IN FOG

Functioning on the brightest day or the darkest night, railroad signals three times more visible in fog than the common wing-and-disk type have been tested in Switzerland. The "luminous signals" are said to have the same appearance to trainmen day or night. The system operates without complicated mechanical installations. Even in the most brilliant sunshine, the signals are conspicuously visible. Two, four or more lights may be mounted on each signal, which is set at the level of the engineer's eyes to avoid confusion.

### AUTO-SLED HAS TRACTOR DRIVE FOR SNOWY MAIL ROUTE

Two extra wheels and tractor drive, together with sled runners for the front axle, have solved the winter problems of an Iowa mail carrier. The equipment to convert his small car into an "auto-sled" now has been placed on the market. The runners are not placed under the front wheels, but are attached to the axle with the bottoms slightly higher than the position of the tire on the road. In deep snow, the runners carry part of the load, making it easier to drive in deep ruts. The extra wheels are attached to the front end of a special set of springs and the track is connected over the two tires.



Runners, Attached to Front Axle, and Two-Extra Wheels with Tractor Drive Convert This Car into an Auto Sled

### SPEECH NOTES ARE PROJECTED AS SPEAKER WRITES



Drawings and Notes Made by Lecturer Are Flashed on Screen as He Writes and Talks

Helping the speaker and lecturer to illustrate his talk, a new projector throws on the screen the handwriting and drawings of the speaker as he writes. It permits the illustrations to be presented without the aid of a second person and without the speaker being forced to turn his back to the audience to write on a blackboard. The speaker, as he faces his audience, writes in the usual manner on cellophane. His writing is projected onto the screen through an arrangement of lenses and an inclined mirror. As the writing surface is filled, it is turned to present a fresh space by means of a small knob without any interruption of the lecture. Or, if the speaker should desire, the notes and drawings may be placed on the cellophane before the speech and then flashed on the screen at the proper point in his talk. Lantern slides may be projected simply by laying them on the illuminated surface of the apparatus. The lecture room need not be completely darkened, since only the projection screen must be shielded from direct light.

☐ Dried sweet milk is being used as a fish food to raise trout.

*Fish Hatchery*  
*Madison, Wis.*  
*Copyrighted material*

*Sept. 9 Commerce 9/12/32*

*Na H. Schindler*

*Estimotele Co*  
*Almena, Wis.*



*B/662*

Automatic Barrier That Is Raised by the Animal as It Approaches Hurdle



### HORSE OPERATES OWN HURDLE WITH AUTOMATIC BARRIER

Horse jumping is made safer for both the rider and the animal by using an automatic barrier that is raised into position by the horse itself as it approaches the hurdle. Formerly, in training horses to jump, human hands raised a pole just as the animal began its leap. Many horses balk at this method and refuse to leap when suddenly confronted with a higher barrier. With the automatic barrier, a thread is broken by the horse as it approaches and the pole is raised into position so quickly before the jump that the animal does not have time to refuse to take the leap. It follows, therefore, that the jump is made with proper posture and greater safety.

### RAILROAD COVERED WITH GOLD LOST FROM CARS OF ORE

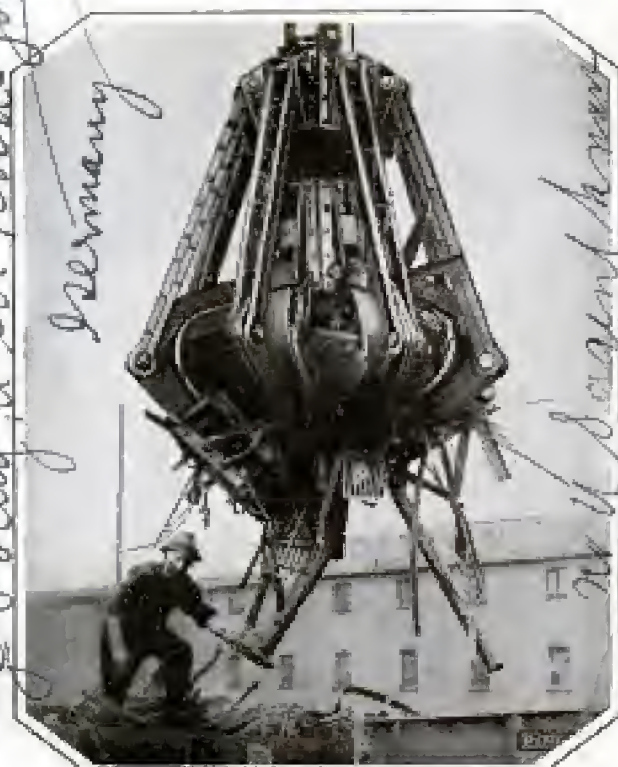
Less than half a mile of railroad track used by a western gold mine recently yielded over \$5,000 in pay dirt in one month after a weigh master noticed that the right of way was literally paved with gold. Before the ore was sent through the various processes, each car was weighed, and this was done by pushing it on the scales, then giving it a shove to send it coasting down the track to the mill. The

weigh master observed that each time a car was bumped in switching, a quantity of dust sifted out. A lease was obtained on the three-eighth-mile track and men began cleaning it up. Ore valued at \$175,000 a car has been shipped to this mill, and it has been estimated that the residue dump alone contains unclaimed gold worth \$3,000,000.

*B/657*

### POWER SHOVEL LIKE OCTOPUS HANDLES SCRAP METAL

Built to operate something like an octopus, a large power gripper is being used in Germany to handle scrap metal, tangled wire and many other materials difficult to move otherwise. It has either six or eight long arms which extend outward from a central axis. When these arms are opened by powerful springs the shovel looks like six sections of an orange peel laid back so the fruit can be removed. This arrangement gives the gripper an extraordinary reach, and when the jaws close, they hold the load in a viselike grip. The gripper can handle 100 tons of ore an hour and has a capacity of two cubic yards. It can be suspended from a crane and is operated from a motor drive through a system of pulleys.



Power Shovel with Six Jaws for Handling Scrap Metal and Other Unwieldy Material

*Ans. Paul D. Flynn Missouri*  
*St. Louis, 5200*  
*Colling, A. S. Poling, Germany*  
*Ans. A. W. Garrett*  
*1324 McIntosh B*  
*Colo. Spring*

*Golden Cycle Mill*  
*Cripple Creek Colo*

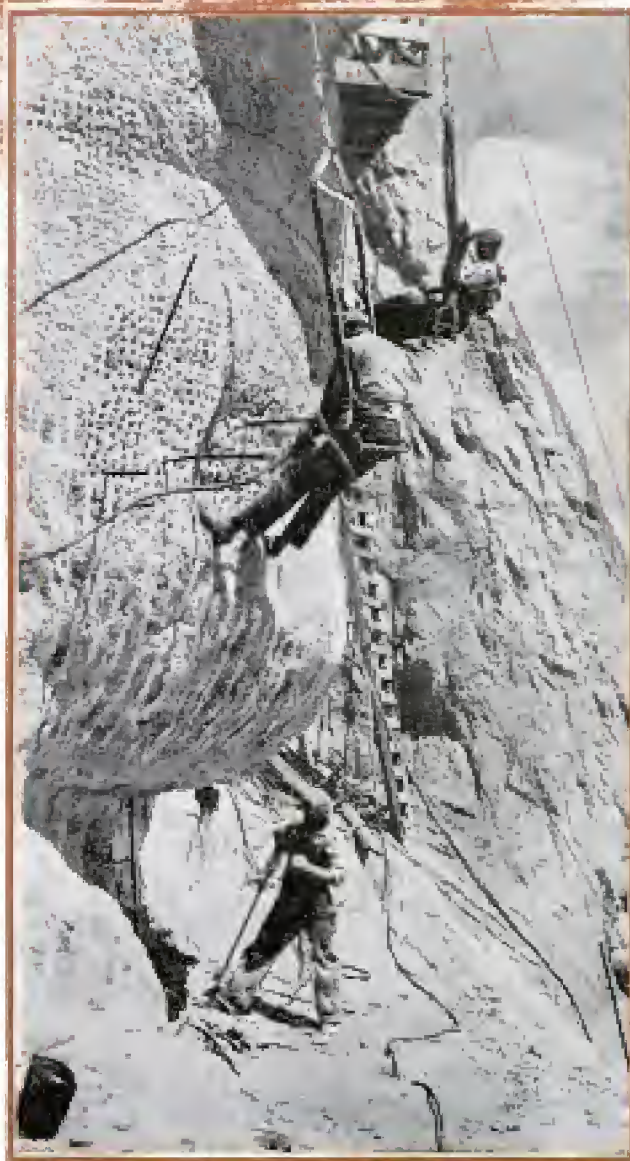
*Poling A. S.*  
*Köln, Germany*



PAUL B. FLYNN,  
MISSOURI STABLES,  
200 BERTHOLD AVE.,  
LOUISIANA, MO. AL

Top, General View of Memorial on Mt. Rushmore;  
Bottom, Close-Up of Mouth and Chin of Washington  
Head, Showing Holes for Light Blasts

Replacing the sculptor's chisel, dynamite is being used to blast the figures of men on mountainsides as everlasting memorials to the nation's leaders. On Mt. Rushmore, in South Dakota, the heads of Washington, Jefferson, Lincoln and Roosevelt are being carved in giant dimensions by explosives, while the figures of the South's leaders in the Civil War are taking shape on Stone Mountain, near Atlanta, Ga. Gutzon Borglum, famous sculptor, who is directing both jobs, has developed a technique of drilling and blasting to such a degree that he can shape a nose or chin on one of the giant heads to within an inch of the finished surface. Even lips, nostrils and eyebrows are fashioned with dynamite, while more delicate work is done by using only blasting caps. Fifteen men using explosives can accomplish in six weeks what it would take hundreds of men three years to do under old methods. The cost is estimated as one-sixth that of a few years ago. The work of carving with dynamite is not done haphazardly. First the area is measured, the features blocked out and the stone marked. High points, such as the end of a nose, a chin or cheeks, are located. Test holes are



drilled to a depth of three feet to reveal the nature of the rock.

see also Frontispiece Nov. 19<sup>th</sup> 92.



OB 1578 Cont. H. J. Williams, Esq.  
Colombarie, 29, Beau-Road  
930 POPULAR MECHANICS  
Beyley, Heath, Mr. London, Eng.

## One Man to Control Traffic on Super-Road



Artist's Drawing of Control Station on Super-Highway in Europe Shows Toll Booth, Hotel and Shops; Note the Arrangement of Approach Roads Which May Be Closed with Iron Gates

One-man control of traffic is provided for a super-highway for automobiles between Evian, on the French shore of Lake Geneva, and Lyons, on the Rhone. The road, 143 miles long, will ascend from national highways by gradients. To avoid congestion and to prevent autos from cutting in on each other's route, access to the highway will be by four roads. Cars on each access route will run in one direction only, the one-way routes being separated so adjoining streams of traffic will flow in opposite directions. Down the middle of the road will run a paved way, under which light and power cables will be carried, and where the super-highway approaches a junction with the ordinary lower road, the central pavement will be widened to form foundation for a station to collect tolls from motorists using the special road and for a hotel and shops. One man at this central station can control traffic and can halt law violators or bandits by closing the access roads with grided doors. Stations along the highway will be in telephone communication with the cen-

tral station, and the road will be lighted. No curve will have a radius of less than 545 yards, nearly one-third of a mile, so autos may hold speeds of 100 miles per hour around the curves without danger of overturning. The road will have a lower layer of metal and rubble, then one of concrete and, finally, granite and other hard stones to withstand wear. Germany also is planning a special automobile highway from Hamburg to Basel to link up with the Italian road being built from Milan. Holland has in view a long auto road linking Amsterdam to Antwerp and Brussels, in Belgium, and thence to the new highway which France will build from Paris to the port cities on the English Channel. Spain plans a Madrid-Irun highway.

### ROCK FORTS OF THE ANCIENTS FOUND IN FAR NORTH

Rock fortresses, used by people of the far north many centuries ago, have been found off the coast of Kodiak island, Alaska. Dr. Ales Hrdlicka, of the United

Science Service

9/15/32  
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# POPULAR MECHANICS

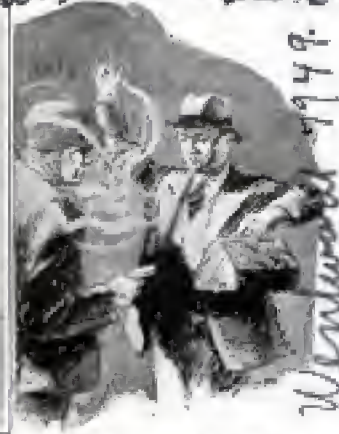
States National Museum, discovered ruins of villages on the summits of high cliffs, almost inaccessible. To reach the top is a real "mountain-goat climb," and Doctor Hrdlicka could not carry even a spade or camera up the cliff that the ancients once climbed with all their supplies. Doctor Hrdlicka believes that the rock fortresses were selected as protection against enemies who might have sought to seize the cliff dwellers' collections of sea-otter skins. Among evidences of higher culture found by Doctor Hrdlicka on the island were beautifully shaped knives of slate, lamps made from rounded pieces of basalt and granite, carvings of fossil ivory with one well-executed portrait of a man, and picture writing on the rocks.

10/62

## TEAR-GAS GUN FOR WRIST IS FIRED BY STRING

Only a flick of the finger is required to fire a small tear-gas gun that is worn on the wrist concealed by the coat sleeve. The weapon straps in place like a watch, and a small wire leads from the trigger to a ring on the middle finger. Simultaneous uplifting of the arm and crooking of the finger discharges the pistol, releasing enough gas to rout a gang of bandits. It is suited particularly for bank messengers or others facing the hazard of being held up.

*Presto Tear Gas Gun Co.*



Tear-Gas Gun for Wrist Which Is Fired by Wire Leading from Trigger to Ring on Middle Finger

*Dr. Wm. Elmer Carlstrom*  
665 W 63rd  
*Chicago*



Comparing Weight of Young Woman with That of Osmium, Heaviest Metal, Magnesium, the Lightest, Gold, Lead and Water

## HEAVIEST METAL OUTWEIGHS LIGHTEST FOURTEEN TIMES

Osmium, the heaviest of commoner metals, outweighs magnesium, the lightest, by about fourteen times. A slab of osmium, one foot square and slightly more than one inch thick, weighs 135 pounds, the weight of a young woman who helped in recent tests on metals. A slab of magnesium one foot square must be approximately fourteen inches thick to weigh 135 pounds. Lead, regarded by most people as the heaviest metal, weighs only half as much as osmium, since a one-foot slab must be about two inches thick to weigh 135 pounds. A block of gold, one foot square, would have to be one and one-quarter inches thick to weigh as much as the young woman. By contrast, 135 pounds of water occupies two cubic feet.

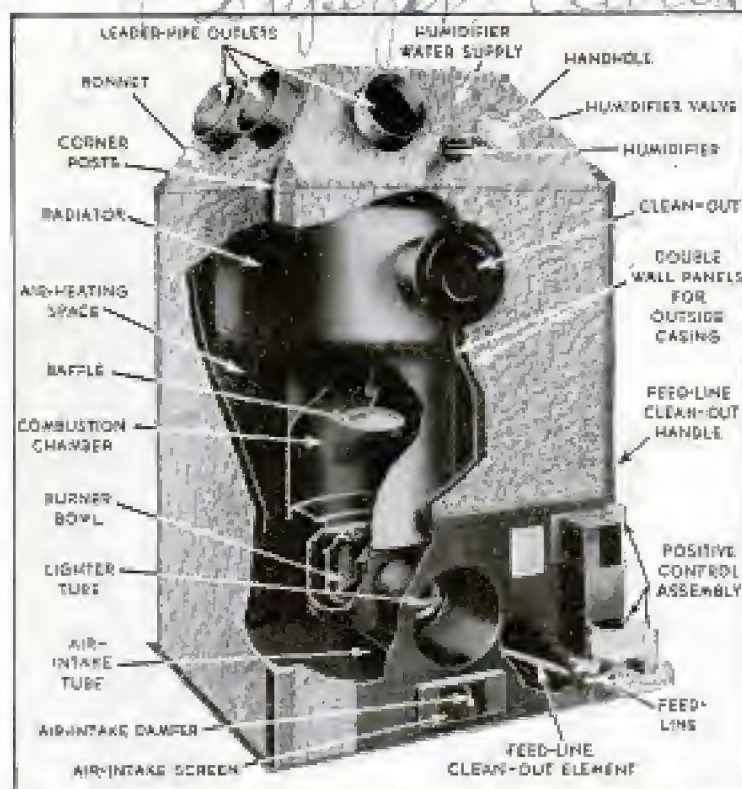
*Aluminum Company of America*  
*Aluminum Refining Works*  
*320 Belmont Ave Brooklyn*  
*Academy of Natural Sciences Phila*  
*Samuel S. Leonard*  
*Associate Curator*



B1564 Perfection Store C  
7609 Piche Ave.

932

# POPULAR MECHANICS



Sectional Picture of Oil-Burning Hot-Air Furnace Showing Simple Operation; No Outside Power Is Necessary

## OIL FOR HOT-AIR FURNACES IS FED BY GRAVITY

Automatic furnaces that burn oil have been produced for heating the home with warm air. No electricity or other outside power is necessary, the oil flowing from a storage tank into the burner bowl through a constant-level valve. To light the furnace, a crumpled newspaper is used, the burning paper vaporizing and igniting the oil. Draft control is so constructed that the heated combustion products pass directly into the chimney when the furnace is first lighted. After the chimney is heated to the right temperature, it produces the correct draft for perfect combustion. The direct opening from the combustion chamber to the chimney closes and the hot gases then pass through the radiator before reaching the chimney.

## PILOTS CAN ASCEND TEN MILES WITHOUT DANGER OF DEATH

Airplane pilots could rise to altitudes of 50,000 feet, or nearly ten miles, without danger of death from such experiences, if the nitrogen gas in their bodies were expelled by breathing oxygen for an hour before such ascents. Sir Leonard Hill,

British physiologist, has reached this conclusion as the result of experiments on animals under low-pressure conditions. Previous tests in France had led to the opinion that 45,000 feet would be the limit that could be attained by a pilot even when oxygen-equipped, unless his body were inclosed in a pressure chamber to shield him from the effects of such great height.

## "ROBOT" RECORDS LOST TIME IN PRODUCTION

Efficiency of production machinery and operators is constantly and accurately checked by a recording instrument which furnishes a visible chart of all idle time and the reason for interrupted production. This recorder is energized by the lighting circuit and may be adapted to virtually any type of production machine. Whenever the equipment is shut down for any reason—lack of stock, inspection, repair, tool grinding, set-up, etc.—the operator registers the cause by dialing the symbol, and the chart times the delay in minutes. During idle time, a red light flashes to



Recording Instrument Which Checks Idle Time for Any Machine and Reason for Non-Production

advise the foreman that production has stopped.

Rich Eszaybar Electric C  
420 Lexington Ave  
New York

Mr. Nature, H. Marton & Co.  
London W.C.2, Eng.

Science News Letter  
9/24/32

Chronology and Internal Service  
1932-1933

Inc. - 505 S. Dearborn, Chicago



B1583 Cmt John L. Coontz  
2910 Pennsylvania, S.E.

Washington, D.C.

# PERILS of the SKY SCANNERS

**H**OW would you like to be marooned for long winter months on a mountain top with no one to keep you company save the howling wind and drifting snow?

How would you like to have your supplies, when your winter's cache had been depleted, brought you and flung at your door from the airways of the world?

How would you like to be let down the side of a precipice hundreds of feet by a rope until you could get a footing to ski off to the nearest village for medicine and help in case of sickness?



Top, Airway-Station Attendant Going down Mountain for Supplies; Below, Beacon Tower Whose Flashing Light Guides Pilot through the Night



Such is the life of Uncle Sam's keepers of mountain radio beacons who, high on lonely Sierra and Rocky mountain outposts, wage a constant battle with the elements and often, during the winter, find themselves shut off from civilization.

These stations, which might well be termed "lighthouses of the land," serve with their flashing lights the progress of hundreds of planes that beat nightly across the continent and up and down the west





coast. Their keepers must always be on the job.

At the Donner summit, California, airway weather-reporting and radio-range station, snow commonly lies at a depth of twenty feet, and sixty-five feet has been recorded. During the winter, therefore, these stations are snow-bound and accessible only from Norden, a rail station two miles distant, by skis or snowshoes up the steep slope of the mountain. Sometimes the keepers must go to Truckee, ten miles away, for supplies and medicine.

"At such times," says the station keeper, "we let ourselves down the mountainside by ropes until we come to a place where the snow lies sufficiently level to let us stand and walk. Then we begin our struggle for Truckee. Blinding glare and nasty spills mark our descent. Hours are spent scouting drifts, and care has to be taken not to start a slide. With wind velocities up to sixty-five miles an hour, one can realize the struggle to exhaustion that is often necessary to gain again our eerie castle."

The establishment of the Donner summit station presented as great difficulties as ever encountered by the keepers in going to and from it in the most terrific weather. Dog teams were necessary at times to transport the heavy steel for its construction. Steel masts were used owing to the presence of wood-destroying termites. Solid-rock surfaces made it nec-

essary to blast post holes for the radio masts. The houses were built on foundations laid above the rock surface as a protection against the deep snows.

Another instance of difficulties encountered in the establishment of airway beacons is that of the



Above, Donkeys Carrying Supplies to Mountain Airway Station; Below, Searching for Weather Data in the Sierras

light at Spencer, Idaho. It so happened that the site of the beacon lay some distance from the nearest available source of electric current. To supply this new station it was necessary for the engineering crew to lay a power line 6,700 feet. "No sooner had we set about this work," says the report of the engineer in charge, "than a heavy snowstorm set in, followed by hail and sleet. It looked as if the work would have to be suspended.

"We were undaunted, however, and pushed ahead with the work following the let-up of the sleet. Here we ran into a new problem. The sleet had coated the poles an inch or more in depth, making them extremely dangerous to handle. Pack animals became necessary to drag them to their places where, eventually, they were



03/652.

set up. Then, as if to celebrate the occasion, the storm broke loose again, but the work continued, and within thirty days, the power line was in and the beacon lights flashing.

Airmen flying these western storm areas can depend at any time, day or night, upon these beacons. The keepers are always there, and a maintenance automobile visits them regularly, making its rounds regardless of the weather. The crew replaces lights, repairs equipment and checks over generally the condition of each station. These maintenance crews care for ten to twenty stations each, depending upon their distances apart.

Not infrequently missions of mercy are performed by these federal outposts. The most notable of these, perhaps, is that of the rescue mission to the Indian tribes in the vicinity of Winslow, Ariz. These tribes, cut off from their homes by heavy snow, were facing starvation on a high, wind-swept mesa where they had gone to gather pinion nuts, their favorite food. During the time the planes were in the air, they were in touch with the nearest airway radio station.

On the daily log of this station, sandwiched between such entries as "All BCDS SKJS accomplished" (meaning all broadcast schedules accomplished); "No. 2 printer off; No. 1 printer on" (referring to the teletype writer machines over which weather information is sent and received) and "Time from NAA clock correct," came the messages that passed between the station and the airplanes that were delivering food to the stranded Indians.

BOOTBLACK'S SHOP ON WHEELS GOES TO THE CUSTOMERS

Shoe Support Attached to Rumble Seat of Auto to Transform Car into Shoe-Shining Parlor on Wheels



Carl Hlanderson  
Beverly Hills, Calif

When a California bootblack found business in his shoe-shining parlor falling off, he decided to take his business to his customers. By attaching a shoe support to the rumble seat of his automobile and loading the car with the various dyes, polishes and cleaning fluids, he evolved a shining parlor on wheels, then established a regular route through Beverly Hills. Instead of shining one pair of shoes for each customer, he sometimes obtains half a dozen pairs at one call.

POWDER METAL IS SQUEEZED INTO SHAPE WITHOUT HEAT

03/623

High pressure is supplanting heat in the manufacture of alloys from powdered metals. Instead of being melted and poured into molds, metal can be shaped at low temperatures by this process. The manufacture of "oil-less bearings" and the fabrication of objects from all ordinary alloys, and from mixtures that cannot be poured from a melting pot because of the great difference in the melting points of the metals involved, are among some of the possibilities of powder metallurgy. Alloys are obtained under this process by mixing the powders of the various metals in the proportions desired. It is not necessary to consider the different melting points, the chemical reactions or the mixing ability of the materials. Then the metal powders are put through the presses, emerging as an object that looks like solid metal. The product is said to be strong.

THIMBLE HAS NEEDLE HOLDER TO AID IN SEWING



It consists of a small clip which is attached to, or rather part of, one side of the thimble.

To aid in sewing, a thimble with a needle holder has been introduced in Berlin, Germany. The holder grips the needle and helps pull the thread through thick materials.

Wied World  
as at Reich  
Inventive Union  
House of Technic.

Charles Hardy, Inc  
415 Lexington Ave  
New York

Patent Secman  
03/580

Emb. Joseph D. Mountain, 2739 Lexington Ave. New York



B/1654

936

Magnetic near B  
421 ~~Solomon Ave~~  
Los Angeles Calif

Cmd. Frank H Cross  
Box 124, Bakersfield  
Calif

Portable Neon Sign  
Operated from Two or  
Four Dry Cells Which  
Will Run It Continu-  
ously, Night and Day,  
for Six Months

Santa Monica  
California



### DRY CELLS OPERATE NEON SIGN AT LITTLE EXPENSE

Operating from two or four dry cells instead of the usual 110-volt lighting circuit, a portable neon sign, two by three feet in dimensions, is proving popular where electric current is not readily available. The self-contained flashing sign is used as a warning signal at railway and street crossings, and can likewise be employed by shops in advertising. The message may be changed quickly, and little current is required to operate it. The display carries three neon tubes and it is claimed one set of dry cells will run it continuously, night and day, for six months. Various colors and types of lettering are obtainable.

### OCEAN BEING DRILLED FOR OIL FROM STEEL ISLAND

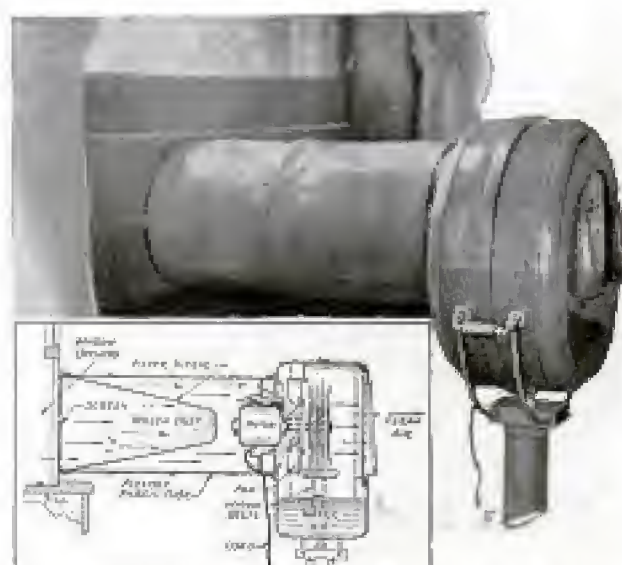
Off shore near Ventura, Calif., a steel island has been constructed in the ocean, and from a derrick mounted on it, a company is drilling in the sea for oil. Off-shore drilling for oil along the California coast heretofore has been made possible by the use of large steel and concrete piers, but the steel island does away with the piers entirely. All equipment, including boilers, is located on the island, and if

production is obtained, the company expects to load ships from storage tanks at the well instead of through a pipe line to shore. To spud in an off-shore well, a surface casing, twelve to sixteen inches in diameter, is sunk into the bed of the ocean with a pile driver, the water removed from the pipe, and then drilling begins with regular rotary equipment and proceeds in the same manner as though the well were on shore.

### VENTILATOR CLEANS AIR AND FITS ANY WINDOW

B/1635

Portable and adjustable to any window, a new type of ventilator filters and washes the air before admitting it to the room. A flexible air shaft, attached to an adjustable steel window insert, is lined with a felt filter sleeve that removes ninety-seven per cent of the pollen from the air, besides the larger particles of dirt, dust and soot. Passed on to the washer, the air is cleansed by being forced four times through water and then is released into the room. Capable of washing and deodorizing 6,000 cubic feet of air each minute, the ventilator will refresh the air in an average-size room in twenty minutes. The machine's pollen-removing feature gives hay-fever and rose-cold sufferers considerable relief.



Filter and Cleaner Rapidly Refreshes Air in the Home;  
Drawing Shows How It Works

Cmd. Frank H Cross  
Box 124, Bakersfield  
Calif

B/16

Indian Petroleum &  
Seacliff oil field

Swartzbaugh Mfg Co  
1336 W. Broadway  
Toledo, Ohio

material





Asbestos shields are being used by fire fighters in Germany to protect them from the intense heat of a big conflagration and enable them to approach nearer the blaze and thus battle it more effectively. One type of screen is shaped like a big umbrella.

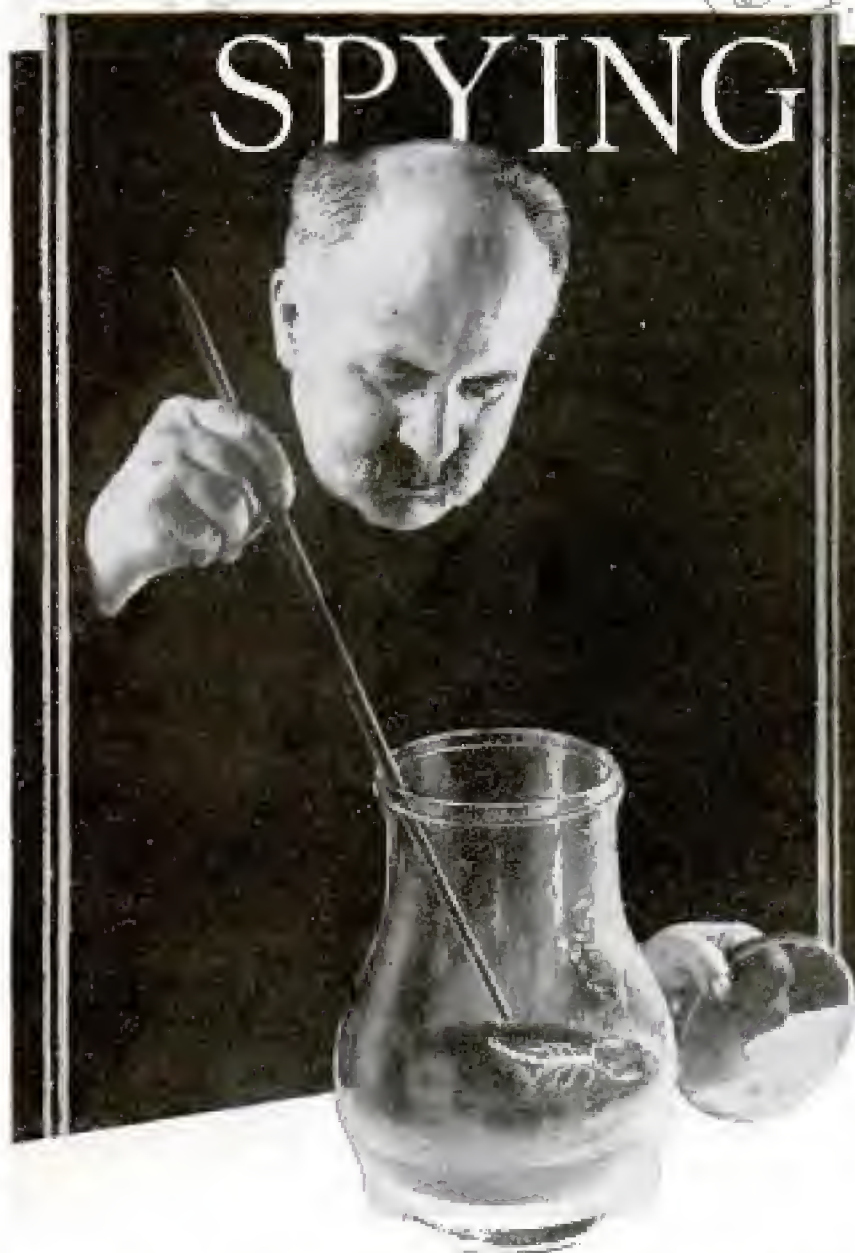
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# SPYING on the

By

BOYDEN SPARKES



Poisonous Scorpion in Its Glass Cage in the Insect Zoo Where Rare Specimens Gathered from All Parts of World Are on Exhibition

**B**UG hunters have just as many thrills in their lives as their fellow scientists who stalk head-hunters in New Guinea; who dig for fossilized remains of dinosaurs in Mongolia, or who try to find some fresh morsel of natural fact behind the ice barriers of the polar regions.

One big advantage of the bug hunter over those engaged in other branches of natural science is that, if circumstances compel, he can find material for a lifetime of study among the insect creatures of his back yard. Yet the bug hunters, too, go to the ends of the earth in pursuit of interesting specimens and facts about them.

So it was that Dr. Frank E. Lutz, curator of entomology at the American Museum

of Natural History, went with an expedition of some of his associates to Barro Colorado island. In constructing the Panama canal, American engineers flung a dam across a tropical river. The waters of a new lake—Gatun—rose in the mountains, and one peak that had been undistinguished was engulfed until only its green top rose above the surface. This is Barro Colorado island.

It was a temporary nest or bivouac of army ants that held the attention of the entomologists. What they found was a fabric of living ants, their claws interlocked to form a curtainlike shelter for the queen and her brood. In defense of these, the soldiers are at all times ready to fight and die. Here is a loyalty untainted by individual cowardice, and it is in probing

into such matters that entomologists find as much that is fascinating as Roy Chapman Andrews might in sorting through old bones in the dried-up swamps of the Gobi desert.

Army ants, as Dr. William Morton Wheeler has pointed out, correspond to the nomadic hunter stage of human development. They have no fixed abode. They are pure nomads and carnivorous; more or less constantly on the march, they ravage as they go. Their bivouac is a tent formed of the bodies of the living ants themselves. In the present instance, according to Herbert F. Schwarz, who accompanied Doctor Lutz to the island, the living curtain of ants was suspended from



# INSECT WORLD



a tree trunk at a level only a few feet above the ground. The trunk was slightly inclining toward its base, thus forming a somewhat cavelike hollow, of which the ants had availed themselves. A liana that crossed the trunk near this point served as an additional support for this animated tapestry.

You might actually have thrust in a stick and tugged at this vital textile without ripping the almost clothlike shelter the ants had formed about that which was precious to them. Along the line of march of the ants there were here and there smaller clusters of the insects comparable in structure to the large nest, constituting possibly temporary caches. But to return to the main nest.

Doctor Lutz determined to take this curious fortress. The big catch, of course, is the queen and he got her along with most of her people. First he put down a barrage of kerosene. Beside him was a bucket of formaldehyde and he was armed with a long-handled shovel.

Then he reached for the nest with the blade of his shovel. A substantial part of



Top, Beetles Imported from Japan Routing Gypsy Moths; Below, Watching Honey Bees at Work

the army ants had been tossed, still clinging as a fabric, into the killing fluid before the insects could organize a defense. A few did climb the handle and bite Doctor





nowadays may press their noses close to a glass jar in which the single dreadful inhabitant is a hairy, black tarantula. An angry rattlesnake might be more easily avoided than the silent rush of this eight-legged, venomous giant of the spider family. Some of the largest specimens are found in tropical America, but these creatures are to be found also in Arizona, New

Lutz. But he did not cease his frantic shoveling until the inner defenses of the fortress had been laid bare and the queen was observed in efforts at escape. Quickly Doctor Lutz reached for her with his forceps and felt that with her capture he had acquired a valued specimen.

From times far in the past primitive peoples have used these army-ants' powerful jaws as surgical instruments. Instead of stitching a wound, it was their custom to draw the lips together and then, one by one, hold angry ants so that their closing mandibles would serve as stitches.

Elephants? Where the elephant hunter stalks his game in Africa there, too, must go the bug hunter who would capture the giants of beetle kind. As the smaller species, which any country boy knows as the tumble bug, center their existence around cows, so there are beetles of an appropriate size similarly linked to the destiny of elephants. *Megasoma Goliath* is of such proportions that Jack Dempsey could not conceal one in his closed hand.

Under the direction of Doctor Lutz, the American Museum of Natural History has established an insect zoo. Visitors there



Above, an Atlas Moth, One of the Largest of "Butterflies"; Below, Tarantula Pouncing on Cockroach

Mexico and Texas. Feeding time for the tarantula is as exciting a moment for the visitors to this zoo as similar occasions in the lion house, and he would be an unusual person who did not feel a shudder as a cockroach is dropped into the glass cavern of this evil thing.

"How many sorts of insects are there?" I asked Mr. Schwarz.

"No one knows the answer to that," he replied. "Certainly there are in excess of half a million known species. New species are constantly being added to the list. Obviously, then, there is plenty of work to be done by those of us who devote ourselves to the subject."

Plenty is the word; as a matter of fact,

(Continued to page 132A)





clark

Two-Man Pursuit Plane Recently Developed for the Army; It Is as Fast as a Single-Seater and Has the Added Advantage of a Gunner in the Back to Protect Craft from a Rear Attack

# PURSUIT PLANE FOR TWO MEN DEVELOPED FOR ARMY

Although experts have always maintained such a ship was impossible, a two-man pursuit plane has recently been built

and delivered to the army, the first of several such craft to be added to its flying forces. The two-seater has all the speed of the single fighter with the added advantage of a gunner in the rear seat for protecting the area back of the pilot.

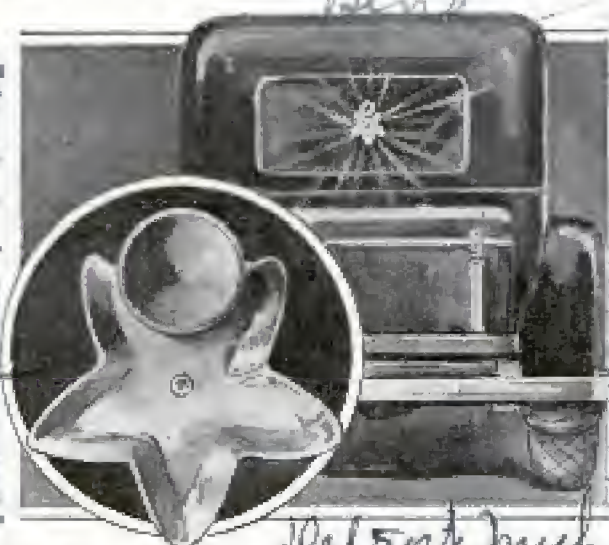
B1598

## REFLECTOR FOR CAR WINDOW HELD BY VACUUM CUP

Added safety for motorists at night is provided by a star-shaped reflector for the rear window which is held in place on the

inside by a vacuum cup. In case the tail light fails, the reflector throws back a brilliant red light as it is struck by the beams from the headlights of a car in the rear. The reflectors are also used for side windows to warn drivers approaching from cross streets.

sample 10 cents



Star-Shaped Reflector for Rear Window of Auto; It Is Held in Position by a Rubber Vacuum Cup

## COOLING MAIL TUBES SPEEDS UNDERGROUND DELIVERIES

B1719

To prevent overheating from friction, a refrigerating system has been installed in the underground mail tubes of the Berlin post office. These tubes, operated by compressed air, are used in handling special-delivery mail, and it was found necessary to install the cooling system in the busy section connecting the post office with Tempelhof airport. Letters are dispatched from the main post office direct to the airport without stops en route by use of a system of switches which enables the substations to route mail past them.

subject of Commerce of 1918

Robert Muth

Jenkins Enterprise Co Berlin, Germany

12558

Pinehurst Ave



3 16 21

Welding and erecting roof

J. R. Welding Co

POPULAR MECHANICS

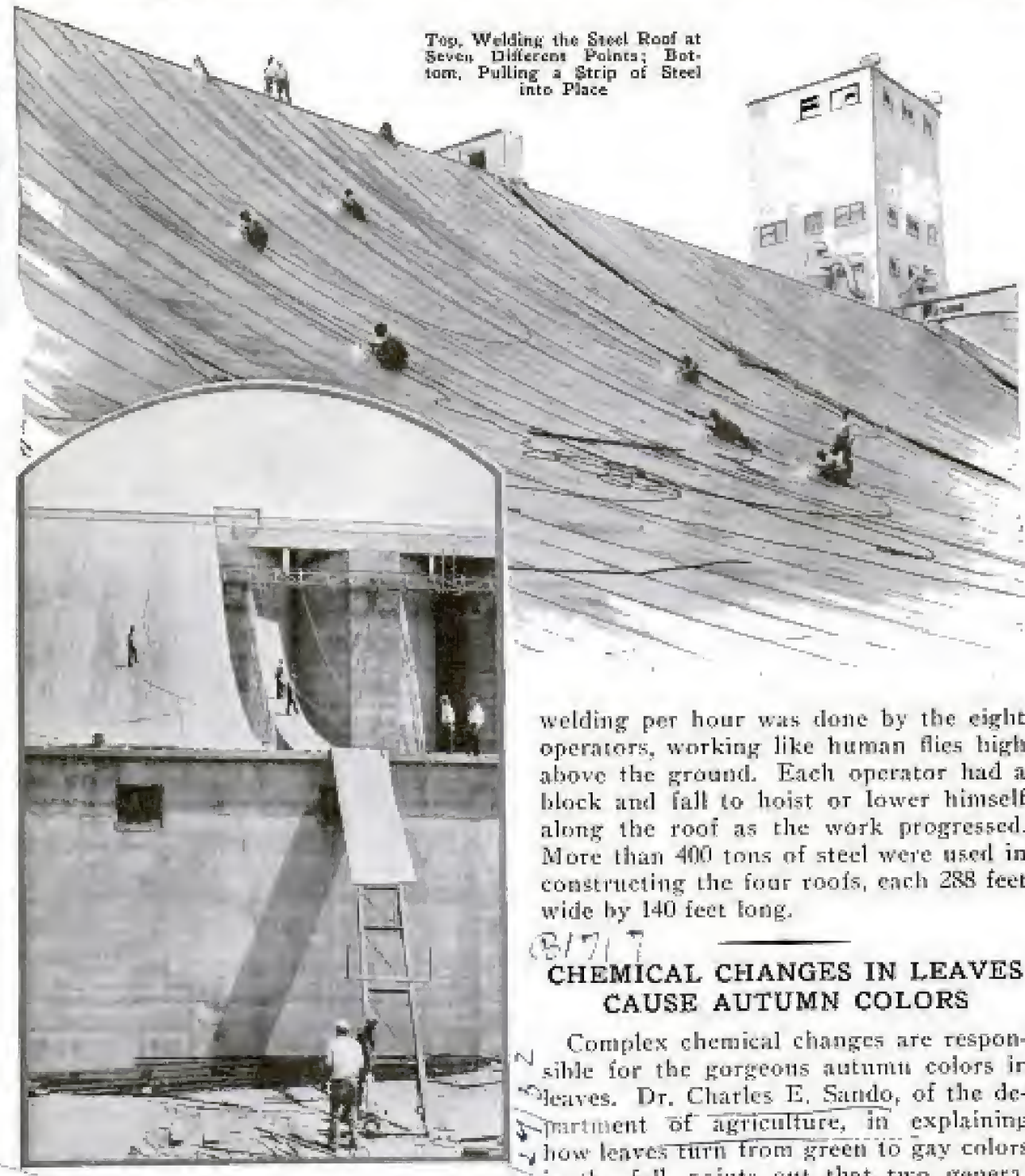
138 Centre New York

942

erected by Lincoln Electric Co 13010 Cort Road Cleveland Ohio

# Self-Supporting Steel Roof Made by Welding

Top, Welding the Steel Roof at Seven Different Points; Bottom, Pulling a Strip of Steel into Place



welding per hour was done by the eight operators, working like human flies high above the ground. Each operator had a block and fall to hoist or lower himself along the roof as the work progressed. More than 400 tons of steel were used in constructing the four roofs, each 288 feet wide by 140 feet long.

81717

## CHEMICAL CHANGES IN LEAVES CAUSE AUTUMN COLORS

Complex chemical changes are responsible for the gorgeous autumn colors in leaves. Dr. Charles E. Sando, of the department of agriculture, in explaining how leaves turn from green to gay colors in the fall, points out that two general classes of chemical compounds, carotinoids and anthocyanins, help trees and plants dress up. Carotinoid pigments are present in all leaves but are masked most of the time by green coloring matter, chlorophyll, which is rapidly destroyed in the autumn, permitting the carotinoid yellow to be seen. If no other masking pigment is present, such leaves become pure yellow or orange, like tulip tree, willow and sassa-

Arc welding has made possible the first self-supporting steel roofs. No columns, stanchions or other supports were used, resulting in increased space in the four grain elevators on which the new roofs were laid at Albany, N. Y. Seventy-six sections of steel sheets, 140 feet long and fifty inches wide, were welded together to form a curving roof supported only at the top and bottom. Forty to fifty feet of

erected by New York port authorities for port of Albany

Washington D.C

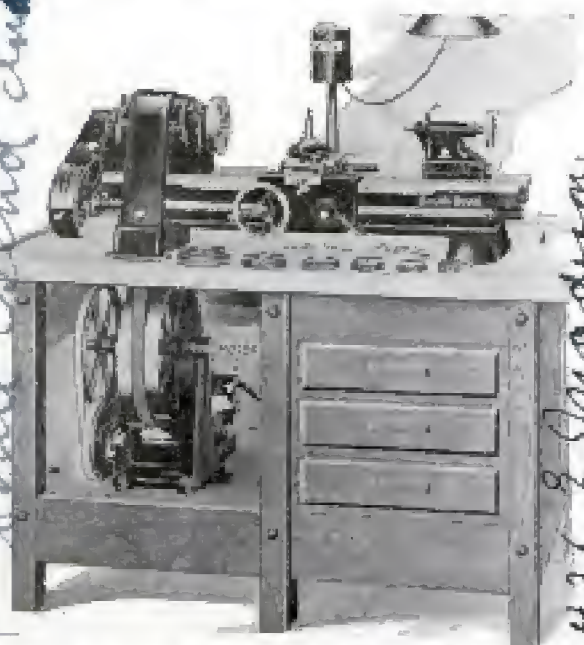
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frass. The anthocyanins are dissolved in the cell sap and also are concealed by the chlorophyll, except in a few purple or bronze-leaved plants. When the chlorophyll is broken down, certain changes in the carbohydrate content of the leaves may cause an increase in the anthocyanins, resulting in strong reds and purples of sumac, blackberry, sweet gum and the oaks. Sometimes the two classes of pigments are found mixed in the same plant or tree, causing a gorgeous mottling of yellows and reds.

**DOWN-PULL DRIVE FOR LATHES DECREASES VIBRATION**

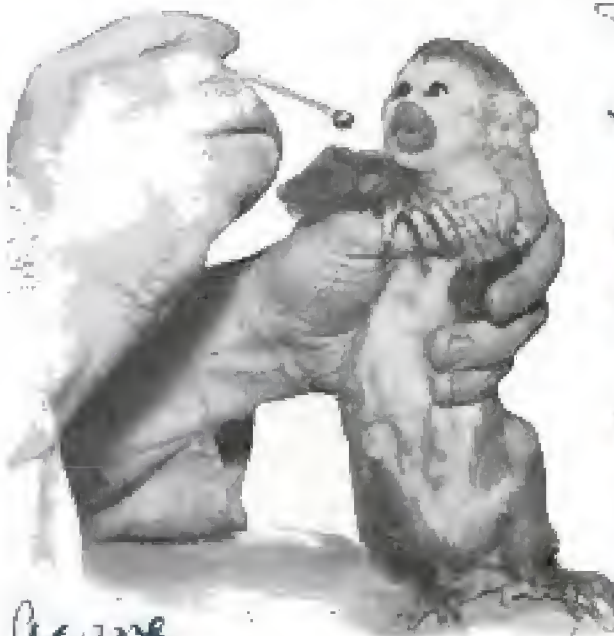
To provide greater steadiness and decrease noise, a small precision lathe with down-pull drive is being offered. It is driven by belt from a reversing motor mounted under the bench, directly beneath the headstock. Because of its compactness, convenience and safety, this tool is well adapted to the experimental, home or general repair shop. It is of the metal-cutting type but can also be used for turning wood, hard rubber and compositions owing to the wide range of spindle speeds provided by the back-geared headstock. There is an index plate which tells the operator at a glance the proper gearing necessary to obtain any desired power feed, and also shows the gearing for cutting various screw threads.



Bench Lathe with Down-Pull Drive, Which Offers Greater Precision by Decreasing Vibration

*South Bend Lathe Works.*

**HOSPITAL FOR TINY AILMENTS HAS PETS AS PATIENTS**



Moss Monkey from South America Receiving a Pill in San Francisco Pet Hospital

Rare furred and feathered pets form the exclusive clientele of what is probably San Francisco's most unusual hospital. Here, birds and animals from all over the world receive clinical care to keep them fit in alien surroundings.

**FORTUNE WAITS FOR PROCESS OF SEPARATING METALS**

Practical separation of mixed metals challenges the world's inventors and metallurgists. A fortune awaits the man who devises some machine or process for extracting the billions of dollars worth of rare minerals from that rich field in southern Oregon. Experts assert that this part of Oregon has more metals than any other district in the world, but they are so mixed that their full value cannot be extracted. Millions of dollars in placer gold have been taken from this area, but in addition, chrome-iron, platinum, palladium, iridium, osmium, ruthenium, tantalum, and many other rare minerals, that sell at \$19 to \$75 an ounce are present. But no practical method of separating the complex mixtures has been found.

The ocean contains enough salts to cover the United States with a layer more than a mile and one-half deep.

*Science News Letter*

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*Conducted by John L. Sullivan*

*31731*

*End Miss Jazie  
Isabel Alder News Telegram  
Portland Ore*

*4268 Precision & Speed Ltd*

*4268 Precision*



# The RADIO DOCTOR



By JAMES MONTAGNES

**I**N the radio room of the Canadian government's department of marine, Ottawa, a message boomed out of the loud speaker. An operator decoded it on a typewriter, sent an answer, reached for his telephone, and called Dr. F. S. Parney. He repeated to the doctor the message he had just received. It had originated at the radio station at Cape Hope's Advance on the south shore of the Hudson straits, 1,200 miles north of Ottawa, over a desert region of rock and bush and unmapped lakes. The message asked for medical advice for a two-year-old Eskimo girl who was running a temperature.

The baby had a pain in the left side of the abdomen and had been given first aid. The doctor's reply by radio was to put the baby on a liquid diet for a few days. Five days later Doctor Parney was informed that the girl had fully recovered.

Doctor Parney is Canada's official long-distance doctor. His patients are as a rule anywhere from a thousand to two thousand miles distant. He diagnoses their ailments through the symptoms reported by short-wave radio from the distant Arctic. His instructions are winged back through the air, precise and detailed. To aid the



Top, Obtaining Medical Advice by Short-Wave Radio; Bottom, Arctic Plane with Engine Hangar That Provides Shelter for Nose Only



# *-Life-Saving in the Arctic*



Above, Air-Ambulance Pilots Ready for Duty; Left, an Ambulance Plane of the Northland Relieving

Last winter a fishing boat's radio made contact with the Canadian government's station at Resolution island at the Atlantic entrance to Hudson straits. It flashed for advice for one of its sailors, who had been washed through a scupper door and had had half his scalp torn off and sustained a fracture. Resolution island called VAY, Cape Hope's Advance, on ship wavelength, and VAY relayed the message on the short waves to Ottawa, VAA. There Doctor Parney wrote out a very detailed message for the stitching of the sailor's scalp, and by way of VAA to VAY to Resolution island the message went, from where it was sent to the ship. A week later Doctor Parney was advised by radio that the fishing vessel had reached Reykjavik, Iceland, with the sick sailor still living and in the hospital there.

Two chains of radio stations are operated by the Canadian government in the northland, one along the Arctic coast and the other inland. From these stations come many calls in a year for medical aid, some requiring simple remedies, others operations. Experience has made the radio operators skilled in giving exact information over the air for the radio doctor. They have also learned to treat simple cases

sick, the radio operators at Canada's northern stations are all equipped with a first-aid kit and a medical manual.

A trapper who had been wounded by one of his traps in the middle of winter, did not find his wound healing properly. He was sick, but harnessed his dogs and set out in the bitter cold to make the radio station at Cape Hope's Advance, fifty miles distant. Blood poisoning might set in, so he made the difficult trail to come staggering into the post. There the operators treated him, and summoned the radio doctor. The Ottawa physician advised an operation, and directed it by radio. The trapper recovered.





Left, Short-Wave Operator of the Far North Copying a Message Coming In from the Radio Doctor; Below, One of the Ships of the North Which Has Brought Many Patients from Remote Places to a Hospital and Doctors

without assistance from Ottawa, and to do simple operations on instruction from the invisible physician.

To the most remote points in Canada, Doctor Parney is the only physician who can be reached. But to many other remote and isolated regions of the northland, medical aid can be speeded more directly. Doctors and nurses can reach northern posts quickly or patients can be brought to hospitals and doctors in short time. The radio doctor functions where no method of travel will bring medical aid in time.

Late at night, an Indian pulled a toboggan into a northern Quebec mining camp. His load was a man the Indian had found unconscious in the snow, his feet, hands and face frozen. The thermometer, when the man arrived, was fifty below zero. There was no doctor at the camp, no medical aid for miles. But an airplane was expected the next morning, and the man was made comfortable, till the drone of the big plane was heard above the blizzard which had started that morning.

The sick man was bundled into the cabin of the ship, an emergency gasoline cache serving to refuel the machine for its fight with the storm. Within an hour, the plane was off for the nearest rail point, 125 miles away. It was impossible to see twice the length of the plane, so thick was the snow. Below was bush, where a crash meant



isolation and possibly death from exposure. Landmarks were obliterated. Blind flying was the order of the day in this mountainous region. With but a gallon of gas left, the plane landed at its destination, where the patient was given immediate attention and put on a train for Quebec city.

Up in northern British Columbia, far beyond the railway, among high mountains, a man was seriously injured at a gold-mining camp by a premature explosion of blasting powder. It was hundreds of miles to the nearest town and medical



attention. A runner would have arrived too late. A radio transmitter was hastily rigged up, and put in working order by a radio amateur who happened to be at the camp. He made contact with Telegraph Creek, 280 miles distant. There a plane was requested and left for the camp. It was summer, but storms had been frequent, and now another came up after the pilot had left on the mercy flight. He was forced down in that wild bush country, but managed to take off again, to reach the camp in safety. There the injured man, his face and upper part of his body cut and burned, was put in the plane. The pilot headed for White Horse, Yukon territory, more than 300 miles distant. The flying ambulance encountered another storm, forcing the pilot to spend the night



anchored on a small unknown lake till the weather cleared. At White Horse, the patient was told he had a fighting chance to pull through.

Doctors and hospitals are few and far apart in the great northland. Distances are great and the weather is hard. Dog teams and canoes are slow means of travel where the lives of humans are at stake. To the subarctic and the arctic has come the fly-



Top, Typical Patients of the Radio Doctor;  
Center, an Isolated Canadian Radio Station;  
Left, a Northern Pilot in Flying Togs

ing ambulance, freighter of the air, recruited for mercy flights.

In an open two-seater plane, equipped with wheels and not skis, a pilot and mechanic set out one winter's day from Edmonton for Fort Vermilion, 400 miles north in the Peace river country of northern Alberta. A message had come from this pioneer farming settlement that an epidemic of diphtheria had broken out among the Indians. Carrying antitoxin serum, the plane battled extreme cold with its light engine for forty-eight hours and landed at





flights which consumed 128 flying hours.

Gangrene poisoning is dangerous even with the best medical care. A trapper had been wounded in the jaw by the accidental discharge of a shotgun. This was 100 miles in the bush, and his companions brought him to the small post of Keg River in northern Alberta. Gangrene had already set in, the man's lower jaw and part of his tongue having been shot away. A runner made Peace river, the nearest settlement, in two days. A wire to McMurray air base, several hundred miles distant, started a plane at once for Keg River over unsettled bush. It took the pilot just seventy minutes to bring the patient to Peace river.

And so the radio and airplane are helping to save many lives in the Arctic.

### HIGH PRESSURE TO GUARD HOME FROM UNWASHED AIR

High pressure will prevent dusty, untreated air from entering the home of the



Above, Radio Operators at One of Key Stations for Medical Aid; Below, Plane Which Saved a Patient Suffering from Appendicitis

Vermilion where the thermometer showed thirty-eight below zero.

The log of one of the largest airplane operators in Canada shows that the calls for plane-ambulance service are not only for trappers and miners. Included in this year's work of this company, was an Indian with lockjaw, a woman with a fractured leg, a nineteen-year-old girl seriously ill with tuberculosis, an Indian with a poisoned hand, an Indian woman who was so sick she had to be carried to the plane on a stretcher, a woman who tried to poison herself in a mining camp, and a man who had gone blind after an injury. This outfit last year made forty-five mercy

future. Donald R. Dohner, of the Westinghouse Electric and Manufacturing company, predicts that such a system will enable the human family to travel at a faster pace with greater efficiency and less fatigue. He says that future homes will be of welded steel construction, with aluminum roofs and well insulated walls and roof to keep out the winter's cold and the summer's heat. Central plants will heat or cool the home in addition to cleaning, conditioning and circulating the inside air. Less floor space will be necessary, says Mr. Dohner, pointing out that today's dining room, in use only a small part of the time, is particularly wasteful of space.

Director of Air Engineering



*B. F. Isodnick / B17 25*  
*Rubber Co*  
 *Akron, Ohio*

*Carl Waller*  
*1032 Florida Ave*  
*Winton*  
*from Ohio*

**RUBBER TO AVERT  
ICE DANGER ON  
AIR SCREWS**

By coating airplane propellers with rubber, engineers of one rubber company hope they have reduced one more aviation hazard. The "overshoes" consist of thin layers cemented to the metal or wood blades by a patented process. The rubber is treated with a lubricant which reduces adhesion between ice and rubber and prevents chilled vapor forming into thick ice on the blades. There is also a disk for the propeller hub to prevent uneven formation of ice about it. The shoes were tested in a refrigerated wind tunnel with satisfactory results, and are an outgrowth of the use of rubber on wings, rudders and stabilizers to prevent ice formation. It has been found that ice on blades without any protection usually breaks off in large chunks, throwing the propeller out of balance. The object of the coating is to cause the ice to break off in small pieces.



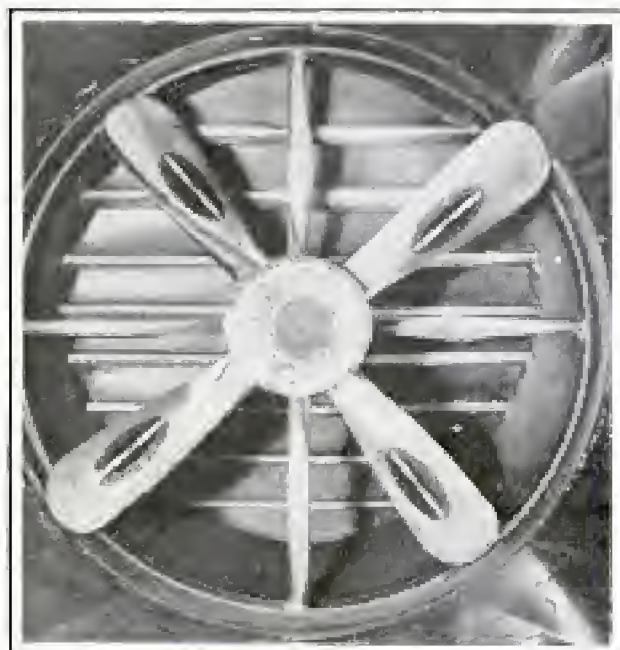
Discarded Materials, Picked Up on the Berlin Dump, Were Used by the Tender in Constructing This Unusual Building

**JUNK USED TO BUILD A CASTLE  
ON THE RHINE**

Materials from the garbage piles of Berlin were used by the dump tender in the construction of an unusual building which is known as "The Castle on the Rhine." Nothing except junk was used by the castle's creator.

**BEWARE STRANGE BIRD PETS  
WARNS HEALTH CHIEF**

Parrots, love birds, parakeets and other similar tropical feathered pets should be avoided unless accompanied by a certificate from a health officer declaring them free from parrot fever, according to Surgeon-General Hugh S. Cumming. Some of the breeding aviaries where birds of the parrot family are raised are infected, investigation has shown. Birds from these aviaries may transmit the disease to purchasers. Although interstate quarantine regulations have been amended to prohibit shipment of birds beyond the state limits of infected areas, "bootlegging" of the pets is anticipated. The surest protection against exposure is to strictly avoid contact with uncertified birds.



Testing Rubber-Coated Propeller in Wind Tunnel: Each Blade Has a Different Rubber Treatment

*B17 96*  
*Science Service wire*  
*9/29/22*

*U.S. Public Health Service*  
*Washington, D.C.*  
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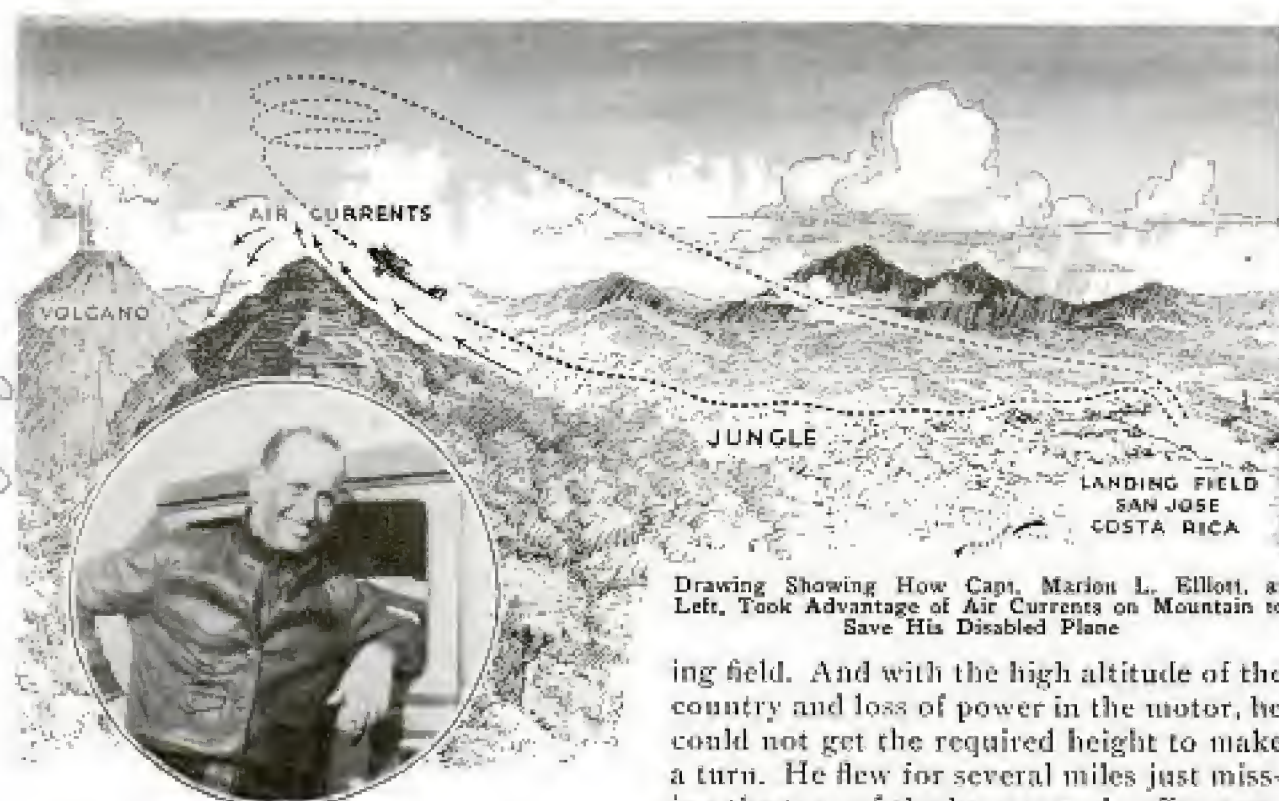


B 1690

Capt. Marion L. Elliott

# "Quick Thinker" Pilot's Trick Saves Plane

Cmb. Lieut. Corley McWarren, Langley Field  
Va. Johnston



Drawing Showing How Capt. Marion L. Elliott, at Left, Took Advantage of Air Currents on Mountain to Save His Disabled Plane

The story of how a quick-thinking pursuit pilot saved a big multi-motored bombing plane by a thorough knowledge of air currents when one of its engines went bad over the jungles of Central America, has been brought to light with the return of the U. S. army personnel who recently delivered five airplanes to the Panama Canal Zone via Mexico and Central America. Three bombing planes and two amphibians, which composed the aerial fleet, flew without unusual incident through Mexico and Central American republics until Costa Rica was reached. The landing field at San Jose, the capital of Costa Rica, is narrow and at a high elevation. The field has been the nemesis of several army airplanes in the past, and it nearly proved the same for one of the bombing planes this trip. The mountains are close at hand and the thick jungle crowds the foothills. The last plane that took off on the recent flight, a bomber, threw a section of exhaust manifold from the left engine when about 100 feet in the air. The engine began sucking fresh air directly into the carburetor and flame from the exhaust played dangerously around the opening. A serious fire threatened. The pilot was not high enough to risk turning back to the land-

ing field. And with the high altitude of the country and loss of power in the motor, he could not get the required height to make a turn. He flew for several miles just missing the tops of the banana and coffee trees with the motors roaring out of synchronization. But the pilot knew he had to get some altitude and get back to the landing field. He had once been a pursuit man, or, as they are called in the military service, a "quick thinker," and had often performed unusual tricks with the little pursuit planes when flying across the Rocky mountains. One of the tricks was to nurse one of the little machines to the top of a mountain when the wind was coming from the right direction and take advantage of the air currents there to get additional altitude. He wondered if the same thing would work with the heavy bomber which he was now flying. There were plenty of mountains at hand for him to try his trick on. There was also a smoking volcano crater directly in the path he was flying. He knew that if he ever got into the hot sulphurous atmosphere of the volcano, he never could survive with his plane. So he deliberately swung the big wings around in a quarter turn and headed for the nearest mountain. He headed down wind. His speed increased to a great velocity and his wheels scraped the tops of the jungle. Some of the other planes which had been hovering above the crippled giant followed closely, and at least some of the pas-



sengers expected to see the bomber strike headlong into the side of the mountain. But instead of striking the mountain, the wings began to creep upward in an uncanny manner. On and on up the mountainside went the plane until it reached the top. Here it shot upward like a game fish out of the water. And immediately the pilot began to swing it in short climbing circles directly above the crest. He had taken advantage of the air currents which rise along a mountainside and the ones which boil upward several hundred feet above mountain tops when the wind is right. When he had gained enough altitude, he made a beeline for the landing field.

### RUBBER WRENCH LOOSENS CAP OF FRUIT JAR OR BOTTLE

Removing caps from fruit jars or bottles requires only a twist of the wrist with a handy kitchen aid which, in effect, is a rubber monkey wrench. It is only a ring of rubber with a corrugated inner surface for gripping the metal cap, but is highly efficient, since it cannot slip and a powerful leverage can be applied. It will also remove nuts if a grip can be obtained on them, and provided no greater force than



Rubber Wrench for Removing Screw Caps from Jars and Bottles with a Twist of the Wrist

is contained in the hand and arm is required to turn them.

### SILENCER FOR ARTILLERY

Two Italian army officers have invented a silencer for artillery and naval guns which was tested recently. It is attached to the muzzle of a big gun and is said not only to repress the noise, but also to make the flame and smoke invisible.



Variable-Pitch Propeller Controlled by Pilot Gives Airplane Effect of a Gear Shift

### "GEAR SHIFT" FOR AIRPLANES SEEN IN ADJUSTABLE PROP

Pitch of the propeller blades can be changed in flight by the pilot of a new-type airplane. The effect is similar to that produced by the gear shift of an automobile. The propeller pitch is controlled through the center of the motor, which also is of new design, being built on the principle of an interchangeable power unit. The controllable-pitch propeller has been the goal of airplane engineers for thirty years.

### SELF-LOCKING TACKLE BLOCK SAFEGUARDS HOIST LOAD

Back slipping of rope or cables during hoisting operations is prevented by a self-locking tackle block so constructed that the cable may move freely in one direction only. When load strain is reversed, the cable is firmly gripped by a lock actuated by the load itself. The lock may be disengaged instantly by means of a manual release. Breakage of the rope linkage also causes the lock to become effective, thus protecting the load and operator from injury.

Mr. Chas. J. Hansen  
2217-44th St.  
Astoria, Long Island City, N.Y.

no street address available

Mr. H. D. McCullough  
Berkeley, Calif.

Letter retd

03, 538

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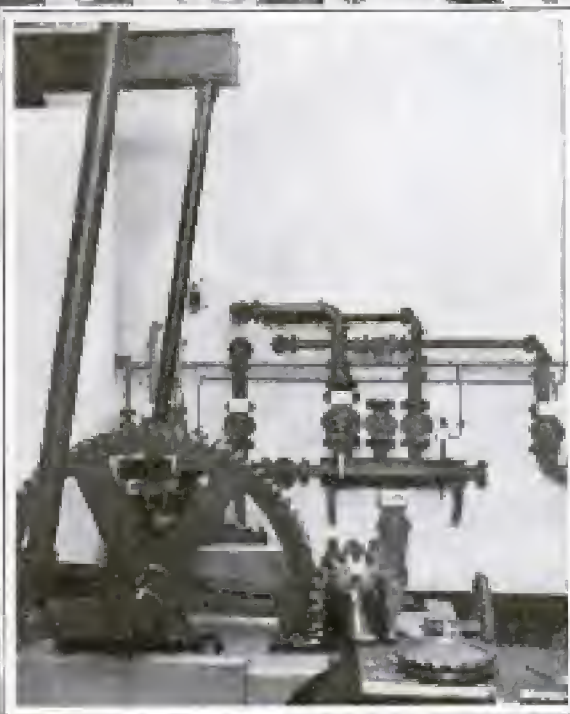
delivered to Tech. Bldg.

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# Artificial Waves Provide Pool Surf Bathing

Cms. Franch Only, 986 S. Pennsylvania St.  
 Denver, Col.



EQUIPPED with a wave-producing machine, a swimming pool at Budapest, Hungary, offers surf bathing. Every half hour, great platoons are set in motion, creating artificial waves by means of compressed air. This is kept up for fifteen minutes, followed by a similar period of calm. Then the cycle starts again. The waves are as high as safety permits. The waters of the pool are radioactive, and the artificial surf bathing is said to be as healthful as that in the Adriatic, where Budapest swam until the map of Europe was remade after the world war, cutting off Austria, and with her Hungary, from the sea.



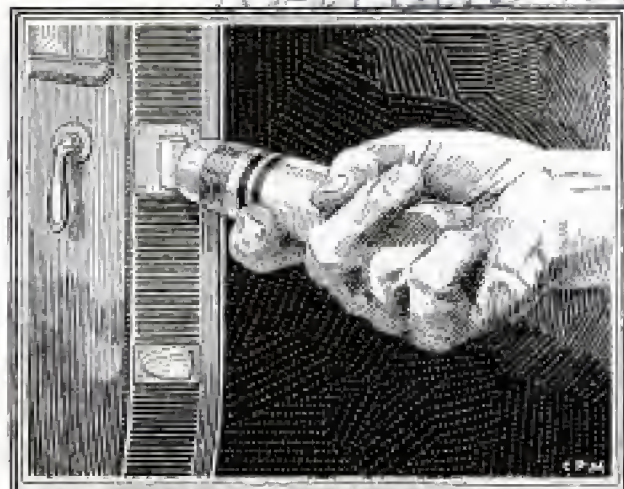


## SPECIAL INK AND COLORED DUST IMITATE ENGRAVING

Anyone can imitate engraving by using a new special ink and colored powder. The lettering or writing is done with an ordinary pen or artist's brush, the powder is dusted over the ink, and the two are fused by heating with an electric plate, alcohol lamp or gas flame. The process is simple and inexpensive. It also can be used with a rubber stamp and inking pad. Any well-sized paper for ordinary writing is suitable. The company making the ink and powder also has introduced machines that will turn out the imitation engraving at higher speed than is possible by hand. These machines do the printing, then pass the sheets through a compartment where the powder is applied and finally fuses ink and powder in a heating device.

## GREASE STICK FOR AUTO DOORS IS STAINLESS

Made up in stick form so that it is easily applied, a colorless lubricant for lock tongues and dovetails of automobile doors adheres to the surface and will not rub off or spot the clothing. When used on hood lacings, it does away with the customary oily film and keeps the hood from sticking. Its qualities make the grease desirable also for easing doors, windows and drawers in homes and offices.



Grease Stick for Lubricating Auto Doors: It Will Not Spot or Stain Clothing



© New York Times

Part of a Barrel Display at the Leipzig Fair: It Included Everything from Kegs and Tubs to Huge Hogsheads

## BARREL MAKERS EXHIBIT SKILL AT LEIPZIG FAIR

Barrels in Europe are used for many purposes besides catching rain water and as containers for apples or potatoes, as was proved by a recent exhibit at the Leipzig autumn fair. The collection of barrels on display included everything from beer kegs, butter tubs and churns to the overgrown and elongated containers used in many industries.

## OPPOSITE WINDS AID PLANES

Two planes in Pacific coast service recently passed each other in the opposite direction, both aided by tail winds of the same velocity and both traveling at the same speed. One ship was flying at 3,000 feet, with a north wind of forty miles per hour, and the other at 8,000 feet, with a south wind of identical velocity.

Our Bureau of Information is for your benefit; use it as often as you please.

American Grease Stick Co. The Chicago Machine

United Air Lines  
400 S. Dearborn Ave.  
Chicago



B1372 Cmt. Thos E. Stearns, Jr  
145 S. Spring St  
Los Angeles, Calif

# The Golden GRAVES



Top, Treasure-Hunting Expedition at Anchor off an Island; Below, Radio Transmitter for Seeking Treasure and Metal Rods by Which Current Enters Earth; Left, Gold Beads and Indian God Recovered from a Tomb

CENTURIES ago an Indian race buried its tribal treasure in the forbidding Coele mountains of Central America. Incantations were uttered to keep it hidden. Nature responded and the jungle covered the spot. Earthquakes and landslides changed the terrain as the years passed. The treasure was "lost," for the expeditions that searched for it returned home empty-handed.

Finally an engineer appeared. Across his shoulders were slung instruments more

magical than the charms of the early tribe. Slowly and carefully he explored the district, driving stakes into the ground, turning dials, and listening with his earphones. Eventually he said, "Dig here." The pick and shovel crew burrowed down and the treasure was brought to light.

Uncanny as it seems, scientists can walk across country and tell you, "Dig here for mineral," or "Here is the place for an oil well." Their delicate instruments probe deep into the earth. With the aid of such



(Letter from Williams about  
Williams in Miscellaneous. Feb) B1372

# of COCLE



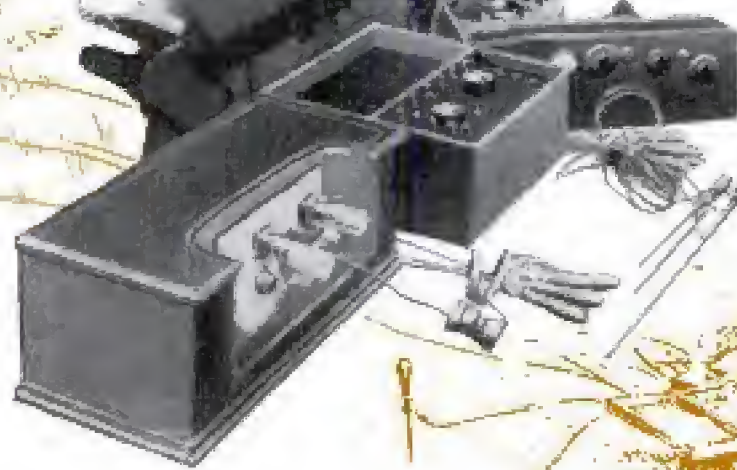
Above, Pieces of Pottery from a Tomb; Left, Lieut. Williams and Radio Receiver for Locating Lost or Buried Treasure



reveal their hiding places when his metal-detecting device is brought within range.

Panama has been the golden crossroad of the New World for hundreds of years. Ancient Indians buried their hoards in the vicinity. Spaniards who dealt in tons instead of ounces collected their cargoes there for transshipment to Spain. Returning '49ers from California tramped over the Cruces trail between the two oceans.

Much of the metal that crossed the isthmus is still there, having been buried in



instruments, Lieut. George Williams, who makes his headquarters in Panama, is turning the hunting of lost treasures into a steady business. He has unearthed hundreds of thousands of dollars' worth of valuables in the last six years. Gold and silver that have been sought for decades

haste against the attacks of pirates and highwaymen. It is estimated that \$5,000,000 worth alone was concealed in the old

Machine taken over by 955  
W. Martin  
717 S. A. A. Heller

Complicated as similar underground he built by. 9035 dense blood  
operation, user will require training  
instruments  
Annual electrical price about \$300.00

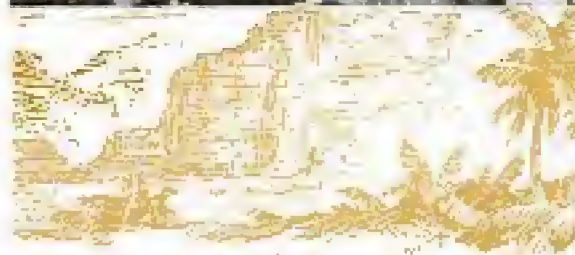
Box 327, Ancon  
6/2/53 Canal Zone



B1372



earthen jar crammed with money. In another spot he finds boxes of golden altar ornaments. Some of the public buildings of the old city are connected by underground tunnels, and in these Williams finds golden pitchers and bowls, drinking cups, sacred objects, and individual caches of gold and silver money. From one tunnel, filled with water, he fished up a solid-gold ball seven inches in di-



city of Panama in 1671 to hide it from the buccaneer Morgan. Lieutenant Williams has explored the ruins and is recovering chest after chest filled with doubloons and dollars. He is taking larger treasures from the ancient Indian graves. Even the Cruces trail is yielding its harvest of gold dust and minted slugs to his exacting search.

Williams had an audience of skeptics when he first tried out his machine. He was seeking a concession from the Panama government to search for treasure and offered to demonstrate his ability before a group of officials. He chose the ruins of a cathedral in old Panama as a likely place and set up his instruments. Treasure had been sought for years in the district and the officials scoffed at the suggestion that any remained. But the machine gave affirmative signals and a hole was dug. Within a few feet the treasure hunter uncovered a heavy chalice of solid gold.

Since then Williams has prowled back and forth through the ruins, earphones on his head. In one place he digs up an



Top, a Treasure-Hunting Boat and Its Crew; Below, Golden Ornaments Recovered from the Tombs of Coclé

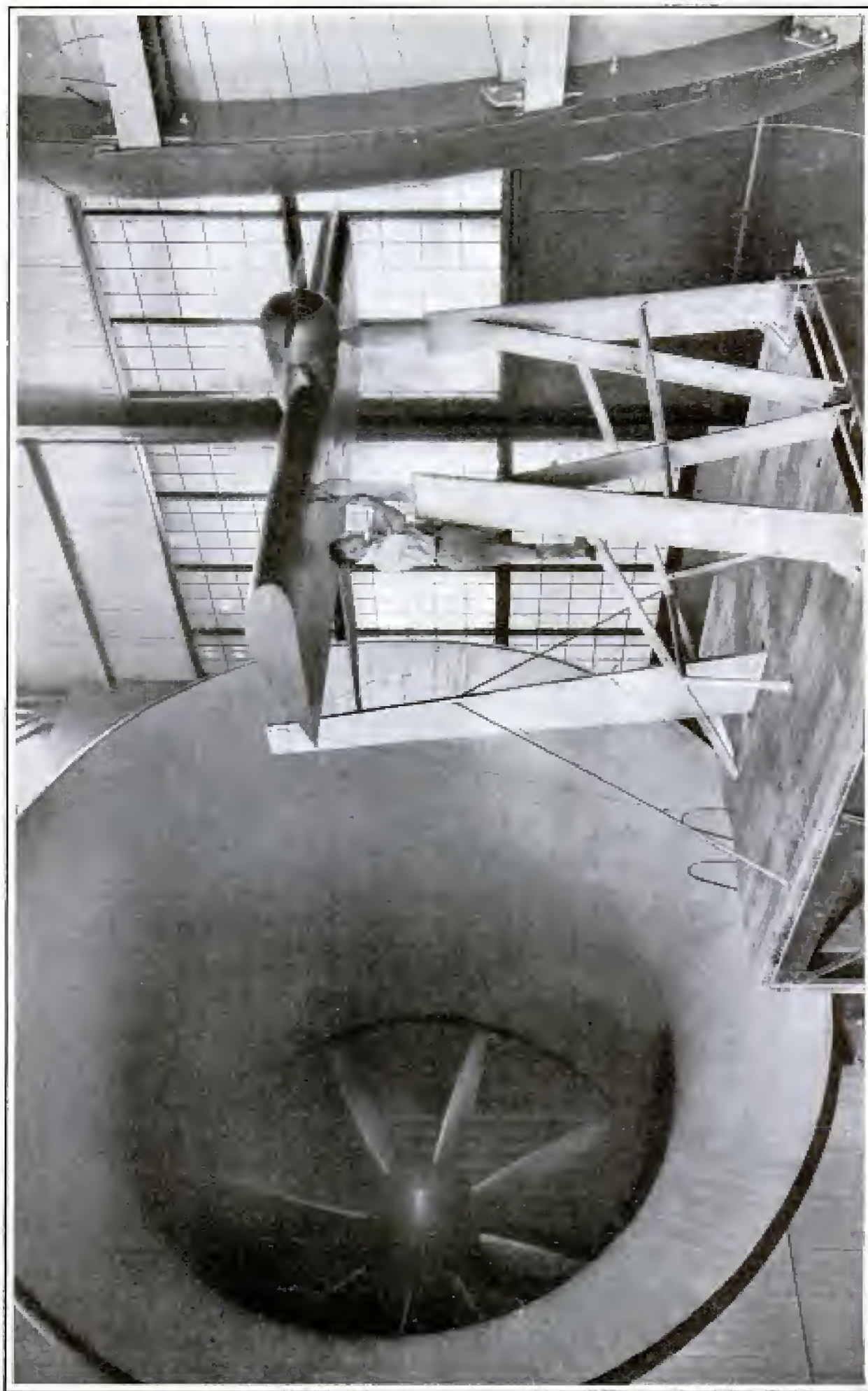
ameter surmounted by a cross. Although these finds are mounting up to an imposing total, Williams regards his treasure hunting in the civilized area as routine work. More interesting is the exploration of ancient Indian graves and temples to which his instruments lead him. Less than a hundred miles southwest of the Canal Zone are the Coclé mountains, the former home of one of the few tribes that resisted the Spanish conquistadores. Here, for 2,000 years, the tribe panned gold from the streams and made it up into ornaments.



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I displayed at home to  
a friend of W. C. C. to  
Mr. W. C. C. to

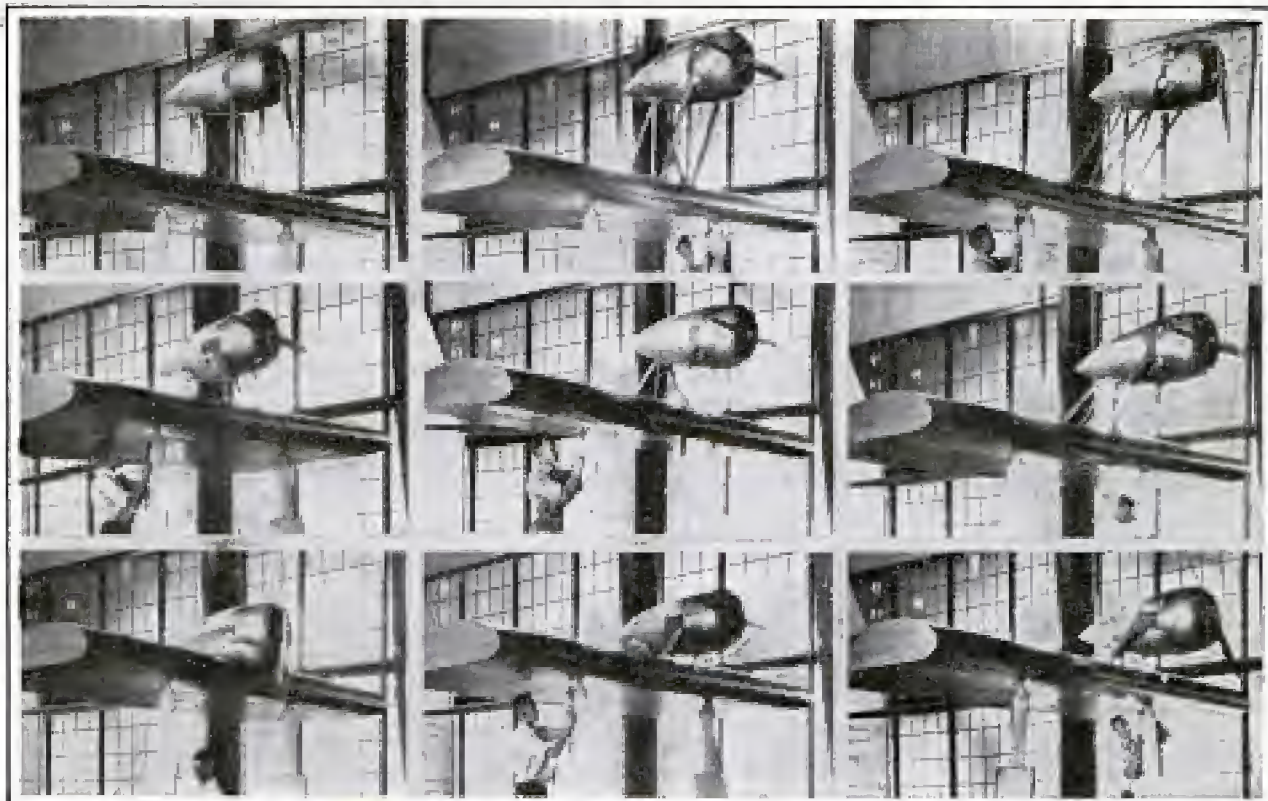




Set-Up for the Making of Tests to Determine Most Effective Position for Nacelles or "Power Eggs" Which House Engines of an Airplane



## Steam-Heated Plane Wing to End Air Danger



Some of Positions Tested for Nacelles above the Wings; in General, It Was Found the Greatest Reduction in Drag Was Obtained by Fitting Nacelle Directly into the Wing Structure

**A** NEW factor—greater comfort for pilots and passengers—is being added to the basic research program of the National Advisory Committee for Aeronautics. Two other factors, increased safety in flight and reduced costs, remain, in that order, the primary objectives of its efforts.

There has been a series of tests aimed to increase the efficiency of multi-engined airplanes by reducing the wind resistance, or heavy drag, of the nacelles which house the engines attached to the wings. The results thus far obtained indicate that, if the engine is mounted a slight distance above the wing, the influence of its nacelle on the air flowing between it and the surface of the wing produces much greater drag than when it is placed higher; that, if it is hung below the wing, the drag is less than when it is in the other position and grows progressively less as the distance is increased; that, if the space between the nacelle and the wing surface is covered, it is even less, and that the greatest reduction in drag is obtained by fitting the nacelle directly into the wing structure.

Thus, it is explained, a way is indicated

to relieve the big airplane of considerable weight, and every pound that can be removed means greater efficiency and lower cost. At the same time, these results tend to add to the factor of safety by making it possible to build a greater reserve power into the plane without sacrificing the other vital factors.

Taking into account the lift, interference, and propulsive efficiency, the best location of the nacelle, with tractor propeller on a monoplane wing, for high speed and cruising, is with the thrust axis in line with the center line of the wing and with the propeller about twenty-five per cent of the chord ahead of the leading edge. The same location also appears to be the best in climb and landing, therefore excels in all conditions of flight.

Experiments also are being conducted in the use of steam heat for keeping ice from forming on the wings. The results are not as yet available, but the idea is interesting. As every student of aeronautics knows, ice picked up in flight distorts the wing curve, burdens the plane and forces a landing if the load becomes heavy enough.

*Ronald H. Wood, engineer*

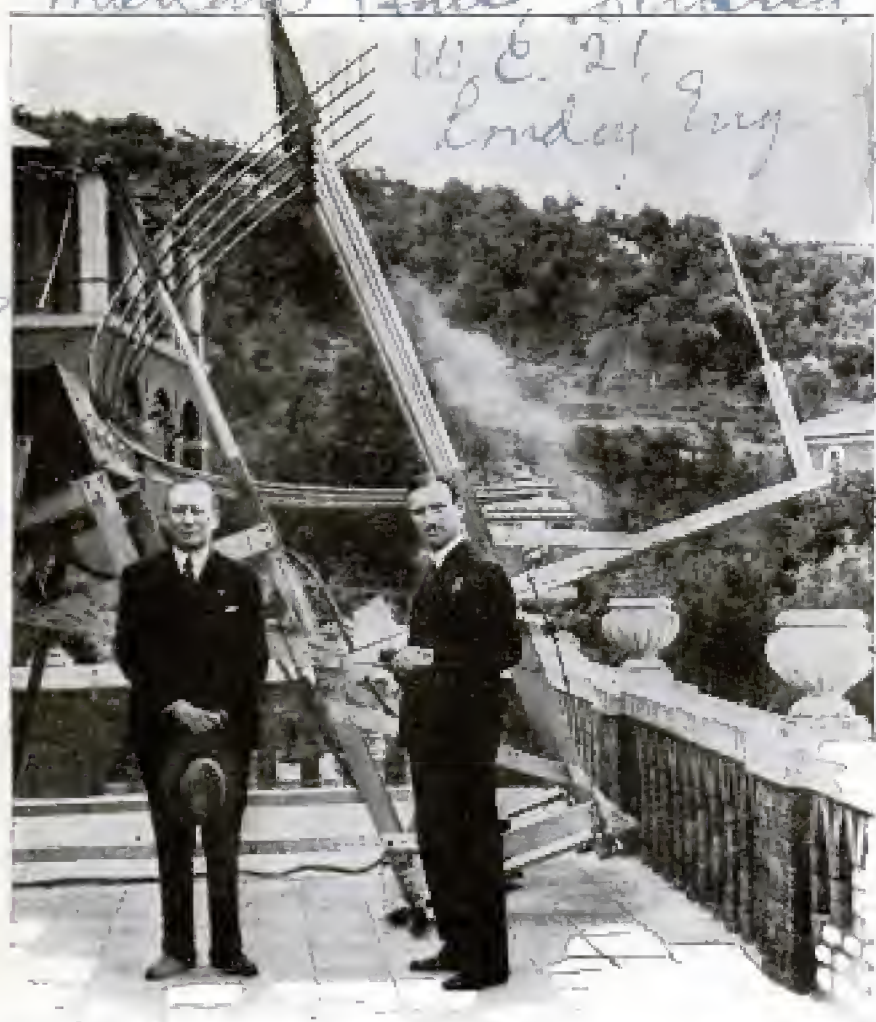


001571 *Marconi Wireless Telegraph Co. Ltd*  
 960 *POPULAR MECHANICS*  
*Marconi House, Strand*

*United Wireless Engineering Co*  
*1940 E. 105th*

*no U.S. agent known*

*W.E. 21*  
*London Eng*



Equipment for Overcoming Curvature of Earth Is Used by Marconi in Successful Transmission by Ultra-Short-Wave Radio

### ULTRA-SHORT-WAVE RADIO SET WORKS AT LONG DISTANCE

Operating on a wavelength of fifty-seven centimeters, or slightly more than one-half meter, ultra-short-wave radio equipment, designed by Marconi, has been tested successfully at a record distance of 168 miles. Both telegraph and telephone messages were transmitted. Heretofore radio transmission on such short wavelengths had not been possible beyond the optical range. The Marconi equipment proves it possible to overcome the obstacle represented by the curvature of the earth. Similar sets in the United States have been operated at horizon distances, or as far as the eye can see. Using the same equipment and a standard yacht telephone set, two-way telephone communication between the Marconi yacht and Rocca di Papa, near Rome, was maintained up to distances of eighty miles, while Morse messages were received at 150 miles.

### ROBOT PHONES FOR POLICE WHEN THIEVES ENTER

When the holdup man commands "hands up" in an office equipped with a new robot alarm, he might as well have shouted "police." For this apparatus, set off by a secret control without any movement by the victim that is visible to the intruder, starts by dialing police headquarters on the telephone. A phonograph disk then is brought into play and repeats "police, attention, robbery" and gives the address. If the machine encounters a busy line, it continues to dial for six minutes.

### POCKET STOVE TO WARM HANDS

Hands and pockets may be kept warm for twenty-four hours without refilling by a stove no larger than a cigaret case.

Benzine is the fuel, an asbestos wick with a protecting metal grid being provided. It gives out 120 degrees of heat.



How Pocket Stove Is Lighted; It Is Safe for Carrying in Clothing on Winter Days

*Abercrombie & Fitch*  
*madison and material*  
*45 E. New York City*



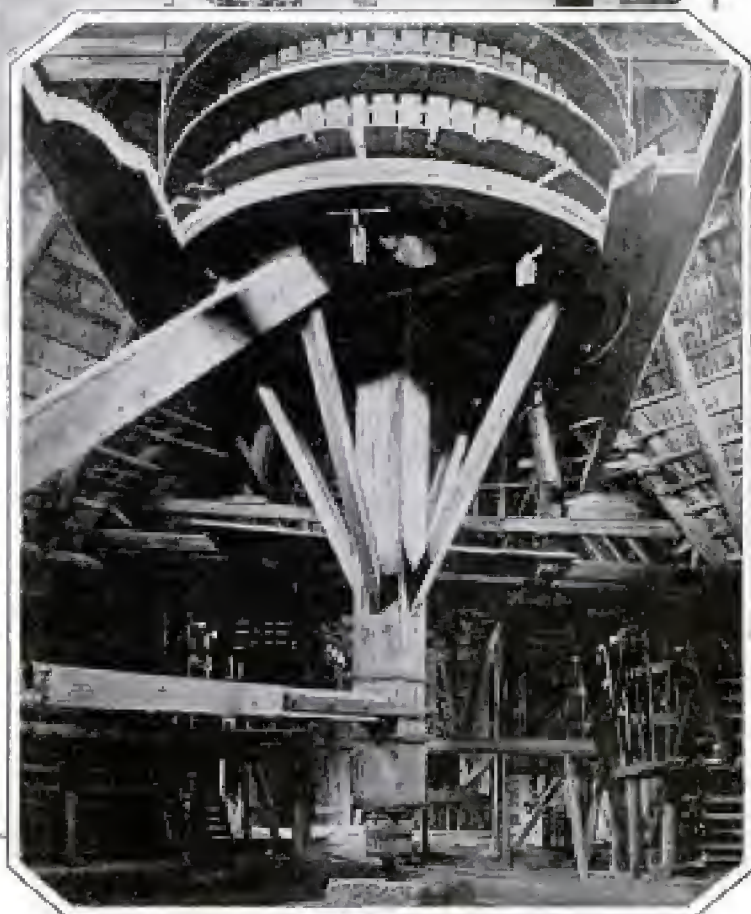
101586 from book "Technische Kulturdenkmalen"

POPULAR MECHANICS

961

OLD-TIME MILLS OF EUROPE  
ARE STILL USEFUL

Europe's picturesque old mill wheels are still in use, serving modern nations in various ways. On the island of Mallorca, off the southeast coast of Spain, stands a row of windmills. Six-bladed-



Top: Windmills on Mallorca Island with Blades Facing Different Directions; Bottom: Mill Wheel for Operating Mine Cages

ed wheels and thatched roofs make these mills unusual. In a silver mine at Johannegeorgensstadt is Germany's only horse-driven wheel for operating the cages that carry the workers to and from the various levels on the main shaft. The old wheel resembles the old-fashioned threshing-machine drive.

ANTS ARE ENEMIES OF  
HOUSE FLIES

House flies were so scarce in the lower Rio Grande valley in Texas this year, despite conditions favorable to their production, that health officials investigated and found ants were exterminating them. There are numerous varieties of ants in the region,

and it was discovered nearly all devour the larvæ of the flies and have become so proficient that there was a noticeable decrease in the number of flies.

Mr. J. H. Walworth  
Larvæ city health officer

Ant. James H. Jagoda, Jr.  
Acce. Delivered. 10/1/1917



# Making Home Tasks



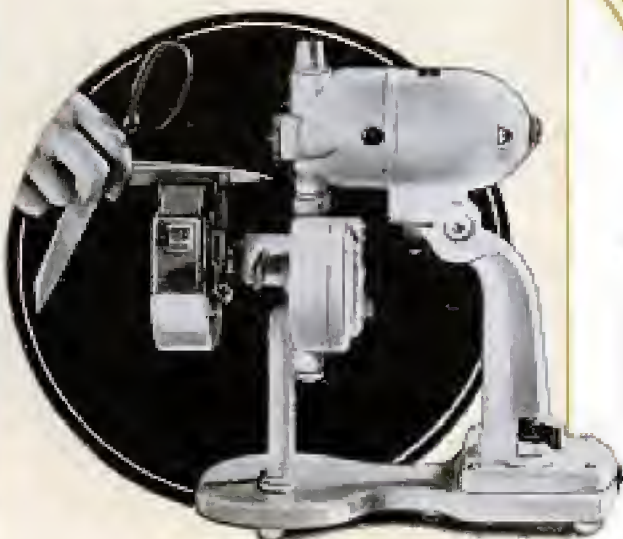
Above, Electric Ice-Cream Freezer with Motor-Driven Dasher That Operates Automatically in the Freezing Compartment of Any Electric Refrigerator; No Salt or Ice Is Needed



Aluminum Broiler Made in Two Sections to Provide a Drain for Fats and to Prevent the Flame Coming in Contact with Food; Handle Is Removable



Above, Electric Outlet with Triple Connections and Extension Cord; It Can Be Attached to Wall or Any Smooth Surface with Rubber Vacuum Cups

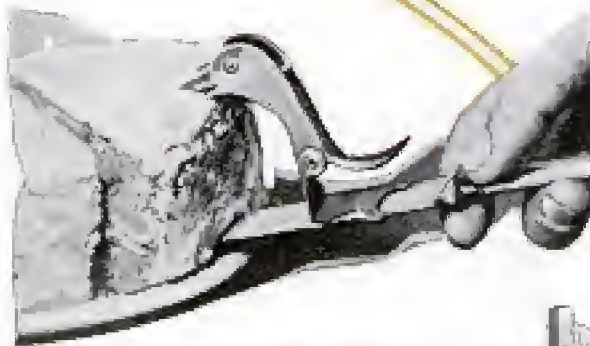


Left, Knife-Sharpening Attachment for a Kitchen Electric Motor; It Consists of a Stone in a Housing That Catches All Grit; Guide Holds Blade in Correct Position; Right, Modern Lighting Unit That Screws into Light Socket Like a Lamp Bulb





# A Pleasure



Above, Handy Clip for Holding Cake Knife Which Can Be Attached to Any Table Knife; Below, Automatic Electric Light Which Can Be Attached to Door Casing of Any Refrigerator; It Switches On When the Door Is Opened



Right, Automatic Cradle Rocker Run by Electric Motor; the Crib Glides Back and Forth without Jolts or Jars; the Speed Can Be Regulated



Left, Swing Faucet and Spout Combination Covered with China to Match Color of Kitchen; There Are No Metal Parts to Keep Clean



Left, Adjustable Grape-Fruit and Orange Peeler Which Removes the Meat Completely without Any of the White Skin or Bitter Part of the Rind; Right, Jar and Bottle Screw-Top Opener Which Adjusts Itself to Any-Size Cap; a Twist of the Handle Loosens the Cover





B1579

964

to be erected at Gargah,  
5 miles S.W. Bombay



Here Is How India's 100-Ton Lighthouse Is Being Built in a British Factory; Note the Steel-Slab Construction

## INDIA'S LIGHTHOUSE OF STEEL TO WEIGH HUNDRED TONS

Constructed of steel in a British factory, India's new lighthouse will weigh 100 tons and will throw a beam that will be visible for twenty-three miles in clear weather. The lighthouse will be erected at a point seventy-five miles south of Bombay. The light will equal 65,000 candlepower.

## ACCIDENTS KILL MORE MALES THAN DOES DISEASE

Accidents kill more men and boys between the ages of five and forty-five than disease. Twice as many die of accident injuries as of tuberculosis, the next greatest single cause of death for this class. As

an example for the nation, the death statistics for Illinois in 1930 are quoted. These figures show that one-fourth of all deaths of men and boys would be prevented by elimination of accidental and homicidal mortality. In Illinois, in that year, there were 2,755 accident and homicidal deaths, as compared with 11,035 deaths from all causes. Only one-sixth as many girls and women in this age group die in accidents, but tuberculosis causes more deaths. The 1930 figures show that in accidental deaths, automobiles are first, drownings second, falls third, and railroads fourth, for the same age class.

B1611

## RUSH JOB EASY FOR ENGINEER BUT NOT FOR RUG MAKER

Modern methods have speeded up production so much that rush jobs are easy for the engineer, but not for the carpet maker. At one plant, a forty-horsepower boiler ordered at seven o'clock in

the morning was on the way to its destination at three that afternoon, being completed in less than eight hours. On the other hand, a hand-made carpet ordered by a London club required four months of labor by thirteen workers. The carpet is sixty-two feet long, thirty-five feet wide and contains nearly 10,000,000 tufts of wool, each of which had to be separately tied to the flax threads forming the foundation. In contrast, a court dress was produced for an American woman in England in twenty-four hours. It was of white chiffon, with hand-painted water lilies and a moss-green border. Hand-made clothing is becoming more and more a luxury, for over ninety per cent of men wear ready-made garments. One Leeds, Eng-

B1635

Illinois Health Department  
State Dept. of Public Health,  
Springfield Ill. 7/15/32

received 7/10/32



B/580 marconiphone Co  
210 Tottenham  
Court Road, London, W1

land, firm has an output of two men's suits per minute during each working hour, while American manufacturers have similar high-speed methods. Turning to bigger things, the engineer usually requires two years to construct a large steamship, but a 5,500-ton steamer was built in seven months. In completing 104 engines in twenty-six working days, the Baldwin locomotive works set what is regarded as a record for engine building.

### LAWNMOWER AND SNOWPLOW IN ONE

Equipped in winter with a pusher for sweeping snow, power lawnmowers did double duty in Denver parks. The drivewheels were filled with lead and spiked with three-eighth-inch bolts to solve the traction problem. It is possible to handle packed snow two inches deep with the power pushers, and also shavings left on the ice by skaters.



Radio "Searchlight" Trained on "Big Ben," London's Famous Clock, to Gather Sound for Broadcasting as the Hours Are Struck

### TONES OF "BIG BEN" BROADCAST BY RADIO "SEARCHLIGHT"

"Big Ben," London's famous clock, now booms the hours over the radio. A microphone has been placed in the clock tower, and a powerful searchlight-pattern loud speaker has been trained on the clock to gather the sound as the hours are struck. In this manner it is possible for all Europe to set its watches by Big Ben.

### SOLDER FOR STAINLESS STEEL SPEEDS UP WORK

Soldering of stainless-steel joints in a practical manner can be done in one-half to one-fourth the usual time with a new flux. In addition, it gives a greater strength of 2,000 pounds more per square inch and stays liquid in the joint more readily. No special tools are necessary, the flux being brushed on and the heat applied in the ordinary way. Excess flux is removed to prevent dulling the finish, and the joint is polished with a special compound made for that purpose.



Instead of Being Stored in Winter, This Lawn Mower Pushes a Small Snowplow in Denver

Jacobsen Mfg Co  
Oacine, Wis

L O B Allen Co  
6719 Perry Ave  
Chicago

Used by C. B. Mark. Park, Denver, Col.



[illegible]

Fig. 1

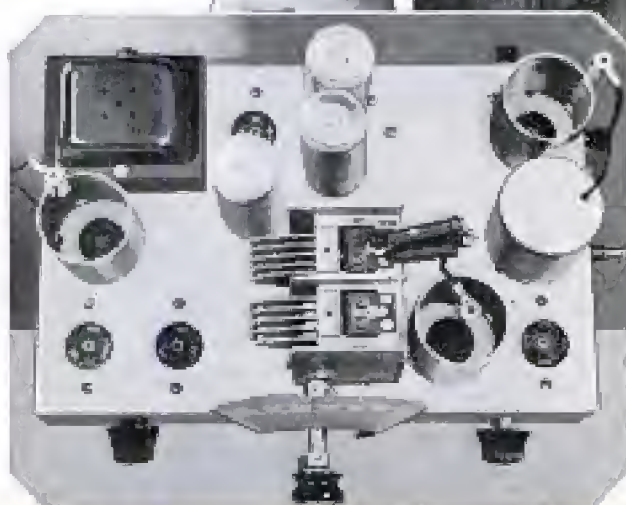


# MAGIC BOX *makes a* short-wave super A.C. Receiver

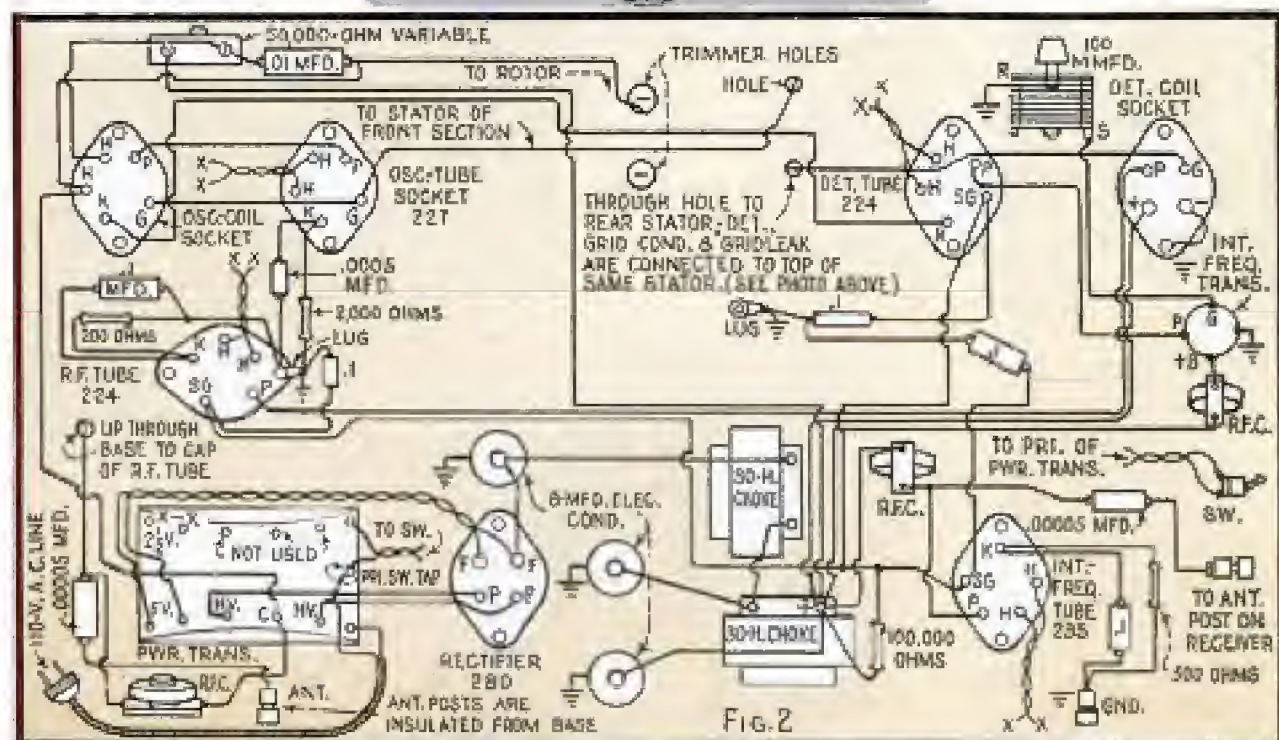
By R. E. DAVY

gain possible, an untuned r.f. stage, employing a screen-grid tube, is used ahead of the screen-grid detector.

A type-227 tube is used as the oscillator, which is tuned with the detector by means of a two-gang variable condenser. This combination results in simplified control and extreme sensitivity that will bring in any short-wave signal that is above the noise level. For example, during the first tests in Chicago, this new converter was used in connection with an ordinary broadcast receiver of the



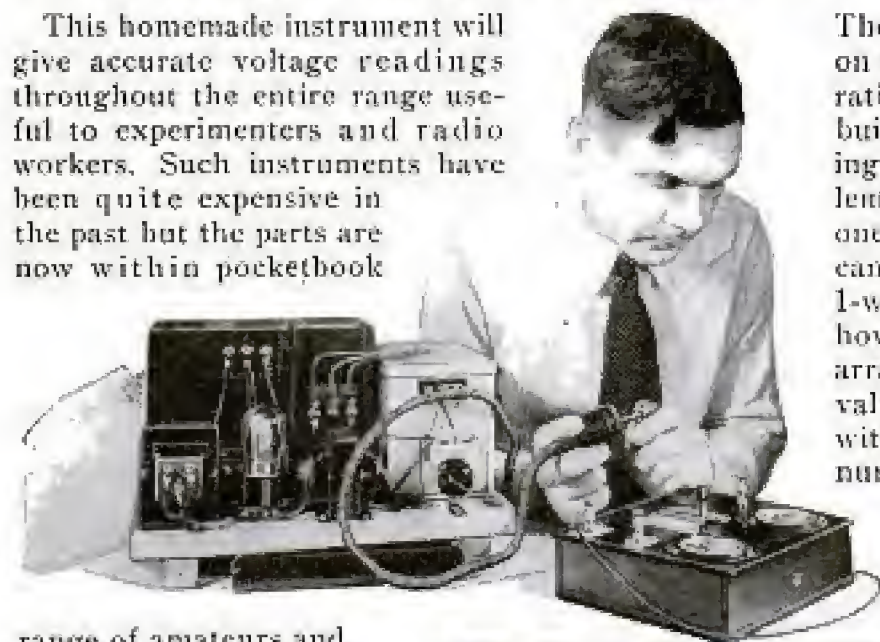
midget type and brought in the following foreign stations at excellent loud-speaker volume: PCJ—Hilver-  
(Continued to page 120A)





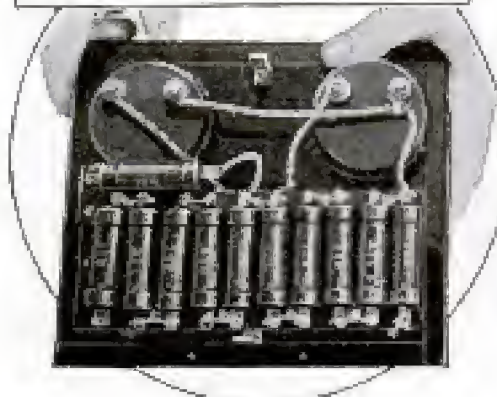
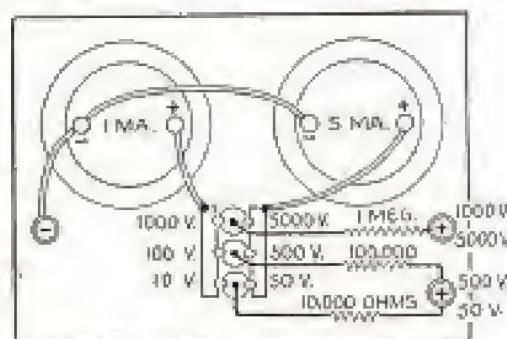
## Building a High-Voltage D.C. Test Meter

This homemade instrument will give accurate voltage readings throughout the entire range useful to experimenters and radio workers. Such instruments have been quite expensive in the past but the parts are now within pocketbook



range of amateurs and service men. Good accurate resistors are necessary as multipliers, and several suitable makes are available. The instrument has two separate meters with different scale readings. These are inexpensive d.c. milliammeters and are rated from zero to one mil and from zero to five mils, respectively. With 1-meg. resistance in series, the one-mil meter will indicate 1,000 volts over the full scale. One meg means 1,000,000 ohms, and this resistor, in series with the five-mil meter, will indicate 5,000 volts over the full scale. It must handle about 25 watts, while most of the small resistors available will not take care of more than from 1 to 3 watts. So, it will be necessary to build up the 1,000,000-ohm resistance by connecting ten 100,000-ohm resistors in series,

The wattage then becomes 25 on each resistor. Types of this rating are standard. If the builder does not require a reading of over 1,000 volts, the problem is very simple. With the one-mil meter the resistance can be a single 1-meg. of the 1-watt type. In this instrument, however, there is a simple plug arrangement for changing the value of resistance, in series with either meter, to obtain a number of different full-scale readings. With 100,000 ohms in series with the 1-mil meter, maximum deflection is indicated with 100 volts. With the same resistor in series with the 5-mil meter, 500 volts will cause full-scale deflection. The 100,000-ohm resistor must be a 2.5-watt type for the 5-mil meter. A third resistance of 10,000 ohms is used for the lowest range on the meters. With this value, 10 volts is full-scale reading for the 1-mil meter and 50 is maximum for the 5-mil meter. The change-over switch may be an ordinary one with taps, or three single-pole, double-throw switches. The meters and switch are mounted on a bakelite panel, and the binding posts carefully marked. The wiring diagram is very simple, the rear-view photo below indicating the method of mounting the various resistance units that go to make up the series values specified.—Edwin C. Ewing, Jr., Chicago.





*RCA Radiotron tube  
harmony*

# New Tubes BRING SILENT TONES to Life

**C**APABLE of reproducing the full tonal range of the many instruments that compose a great symphony orchestra, new types of tubes make modern receivers real musical instruments. Up to the present time, 266 tones by actual count have been missing. A number of these, together with the instruments that produce them, are indicated in the column at the right. Receivers a few months older than those recently introduced employed tubes of limited frequency range that were not capable of reproducing these particular tones. The results obtained have been a fair imitation of the real music but discriminating music lovers were not satisfied. Now for the first time it is possible to obtain from the loud speaker, the rich full-bodied tone that heretofore had only been heard in an orchestra seat.

The new tubes provide greater sensitivity and selectivity as well as better tone quality. They are quieter in operation and have extraordinary reserve power. They will greatly improve short-wave operation, which has been seriously hampered by inefficient tubes. The new sets employing these tubes require smaller power transformers and chassis. Volume control has been improved and the cost of operation greatly reduced. These tubes are not interchangeable with any previous types.

The tube the man is holding in his hand in the central photo, is known as the C-57. It is a triple-grid amplifier with a dome-shaped bulb and is designed for greater strength and stability, lower wattage and quick heating. It is adaptable to special detector and oscillator design and is especially recommended for short-wave operation.

The first tube below at the left, in the same photo, is known as the C-56. This is an amplifier of smaller size and has less tendency toward microphonic noises than previous types. It has higher amplification possibilities than the well-known 27-type by 50 per cent. The next tube at the right is the CX-82, a mercury-vapor rectifier possessing a higher voltage output with better regulation than older types. It has enabled the set manufacturer



(Continued to page  
128A)





Right, Henry L. Carter, Jr., Youngest Amateur Radio Operator; Above, Dr. George W. Kirk, Oldest Licensed Amateur

### Oldest and Youngest Radio "Hams"

Youngest of all the world's licensed radio amateurs is ten-year-old Henry L. Carter, Jr., of Rochester, N. Y., who operates station W8FTB, according to the American Radio Relay league. Henry is a good operator and has a large number of verification cards from other amateurs throughout the United States. The oldest licensed amateur radio operator is Dr. George W. Kirk, who at eighty-one taps away at the key of station W8ARJ at his home in Curtee, Ohio. Many young ladies, known as "YL's," and "OW's" if married, are also prominent in the amateur list. The title of youngest wireless YL belongs to thirteen-year-old Josephine Rohas, station W8EKM, Kenmore, N. Y.

### Filament Supply for Portable Apparatus

Flashlight batteries make an excellent filament supply for portable receivers, oscillators and similar test apparatus that must be compact for practical purposes. It is not generally known that the standard three-cell flashlight bulb draws a comparatively high current—approximately .290 amp. This is slightly in excess of  $\frac{1}{4}$

amp. for the tiny dry-cell battery designed for it. Thus it may be readily seen that four of the popular type-230 vacuum tubes, connected with filaments in parallel, will draw but .240 amp. of current from the flashlight dry-cell battery. These tubes make fine detectors, amplifiers and oscillators and take as little power as possible consistent with satisfactory operating performance. As the flashlight batteries are designed for intermittent service, the best results will be obtained when not more than two of the type-230 tubes are used. As the tubes require 2 volts for the filaments, and the flashlight-cell unit delivers

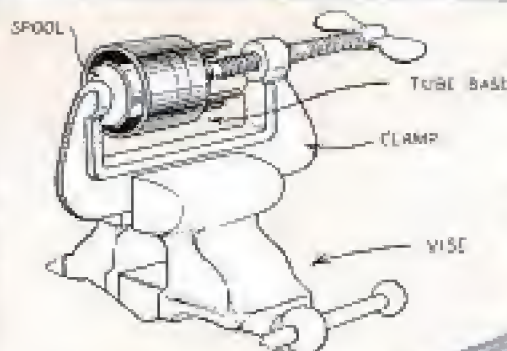


3.8 volts, it will be necessary to use a 40-ohm rheostat to regulate the filament supply for one 230 tube or a 20-ohm rheostat where two tubes are used in parallel. The rheostat is connected in series with one of the filament leads. The B-battery supply, required for the operation of portable apparatus, may be obtained from the small B-batteries commonly used for C-bias in battery receivers.

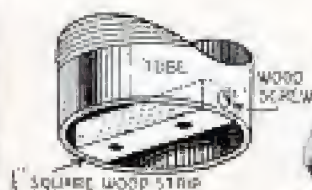
❑ Blueprints covering radio construction articles in past issues can be obtained for 25 cents each; material lists are always available without charge.



# Easy Solutions for Everyday Radio Problems

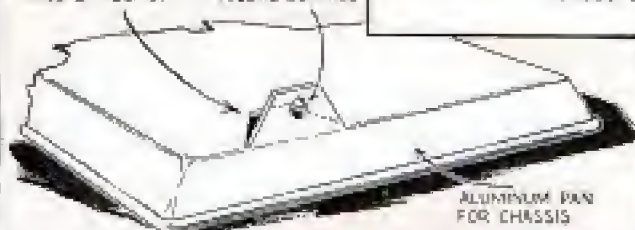


Tube-Base Coil Forms Are Easily Mounted for Drilling by Means of a Spool and C-Clamp Held in a Vise

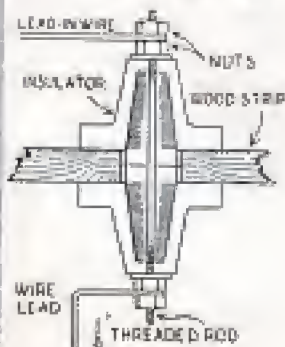


Above, a Simple Method of Mounting Coils Wound on Bakelite or Cardboard Tubing; the Mounting Strip May Be Fastened to the Form with Thumbtacks or Wood Screws

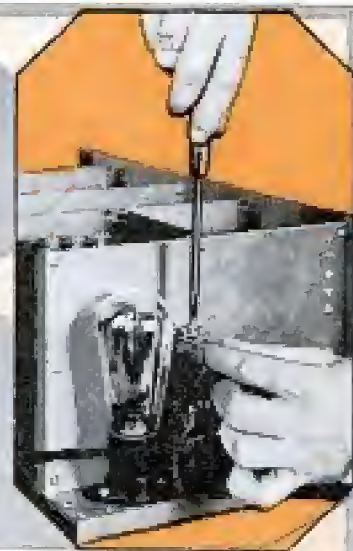
TAB SAWED OUT AND LIFTED UP  
HOLE FOR MOUNTING VOLUME CONTROL



Tabs May Be Cut and Raised, as Shown for Mounting Variable Parts on Aluminum Cakepan Chassis Commonly Used for Modern Sets



Price Tags to Identify Leads; Left, Window-Sash Lead-In Insulators from Old Ford Magnets



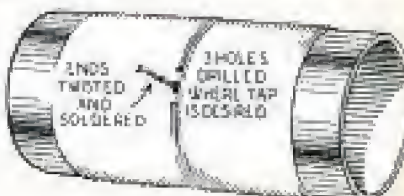
Improved Center-Tapping Resistor Has Movable Center Contact for Accurate Hum Balance in A.C. Receivers; Useful Wherever Resistor Requiring Occasional Adjustment Is Specified

Below, This A-Eliminator Adapts 32-Volt Current for Operating Sets with the New Tubes



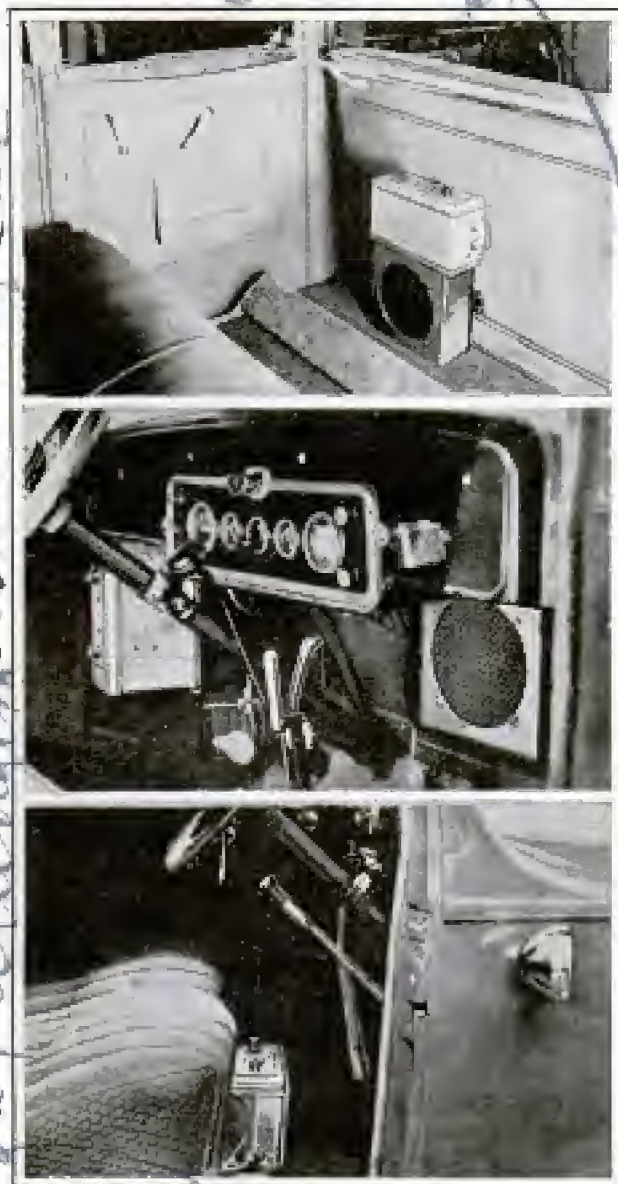
Upper Left, Coil and Condenser Units from Old Neutrodyne Receivers Make Excellent Wave Traps; Below, an Easy Method of Center-Tapping Coils: the Two Wires Come Up through the Middle Hole, and the Ends Are Twisted for the Tap; the Sketch Above Shows Holes Drilled for Anchoring the Terminals

WIRE THRUST THROUGH HOLES IN TUBE TO SECURE WINDING



*Clearwater, Ind. Co.  
255 N. 6th St.  
Brooklyn, N.Y.  
Lita Elchys-C  
murray st  
3rd Wagon, and*





Compact Auto Receiver and Three Methods of Installing It in Car

### Auto Receiver Easily Installed

This small auto receiver is compact enough for easy installation in either of the three positions shown. The upper photo shows the receiver mounted on top of the speaker, directly back of the driver's seat, by means of brackets. The usual under-dash installation is illustrated in the center photo. As the receiver controls are on top and easily reached, the set may be placed directly on the floor between the driver and passenger, as shown below. This six-tube superheterodyne set includes screen-grid tubes, new type 6-volt heater tubes, which decrease A-battery drain, and a full-floating moving-coil dynamic speaker. The B-batteries may be housed under the front seat or sunk in the floor.

### Removing Dust from Receivers

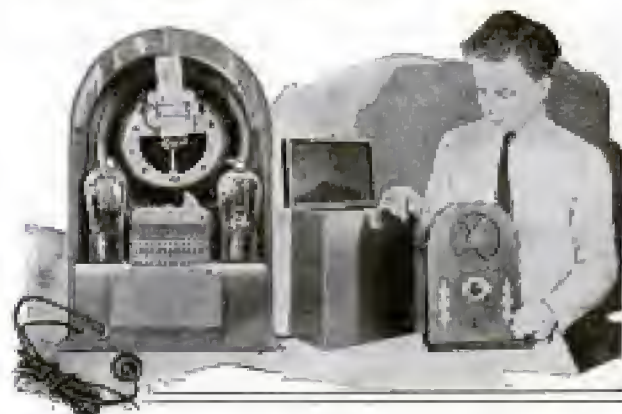
One of the handiest tools for the experimenter, or radio-service man, is a blower for removing dust from receivers. A large auto-tire pump will do for the purpose if fitted with a suitable length of rubber tubing. A nozzle may be made from copper tubing, flattened at the end to distribute the air. With this blower it is easy to clean all parts of the set, especially between the plates of the variable condensers where dust accumulation is a common cause of poor reception.—Don Russell, Joplin, Mo.

### Storage Rack for Small Parts

Screw-top pickle bottles, or small glass preserving jars, are fine for storing machine screws, nuts and other small parts, such as fixed condensers, resistors, binding posts, soldering lugs and tag ends of wire solder. The bottles may be labeled and placed in a rack at the rear of the radio bench. The parts are thus kept separated and in plain view.

### Set Operates on Either A.C. or D.C.

For individual room use in hotels, homes, offices or studios where a small receiver for local programs is required, this portable set may be operated from any 110-volt supply regardless of the type of current available. It will operate on either a 25 or 60-cycle a.c. supply as well as d.c. without alteration. A carrying case in red or black is available, and the total weight of the set is but 6½ pounds.



For further information on any radio construction article write to the radio department; this service is free.





# A Vertical ENLARGER *for Home* PHOTOGRAPHERS

WITH this vertical outfit, costing less than a dollar to build, you can produce enlargements that are just as good as those made on a regular commercial machine. No special lenses are required. The framework consists of an upright, set at an angle, a camera holder and a lamp house.

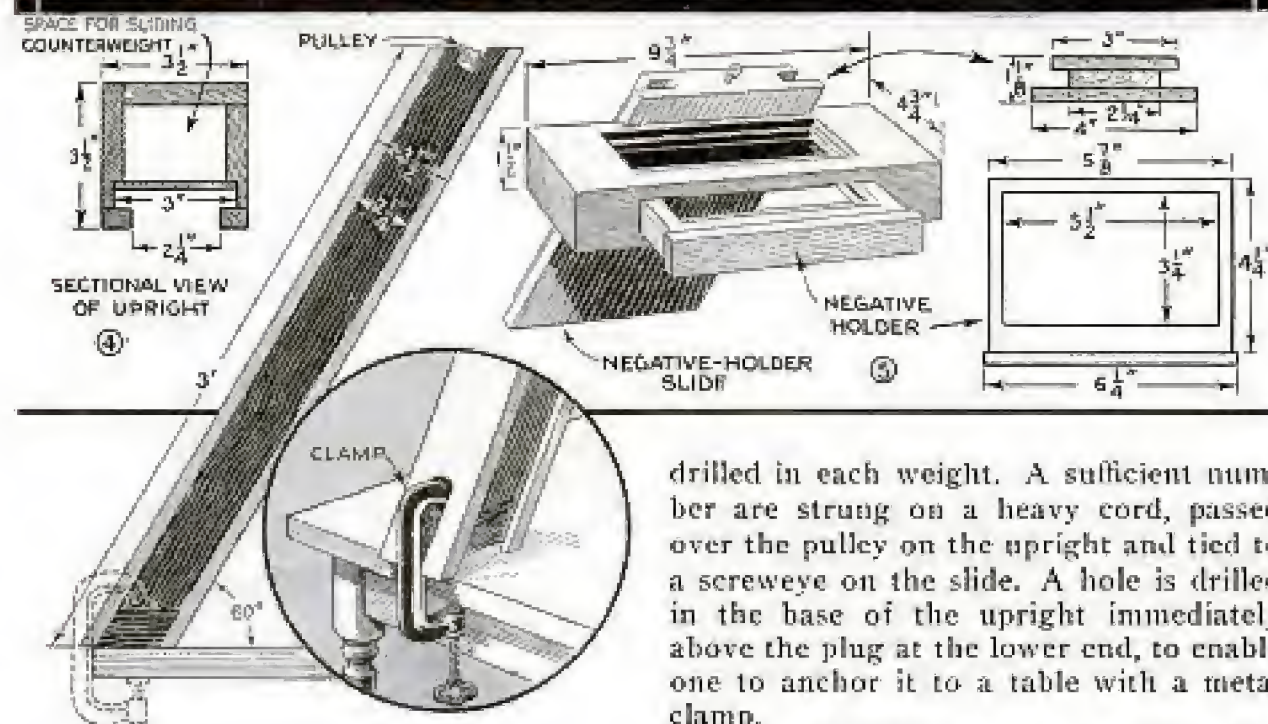
To make the upright, use three lengths of yellow pine as shown in Fig. 4. A mortise to provide a track for the slide is cut the full length of two pieces. For strength, join these with the popular box joint to form a three-sided box. A length of three-ply veneer is then glued into the slide track. The ends are cut off at an angle as indicated, and the bottom is plugged with a block that fits tightly.

The camera holder, in which the negative box slides, is shown in Fig. 5, and consists of two pieces of veneer, with the opening in one larger than in the other, to provide a ledge to hold two pieces of glass. It is securely glued and doweled



to a slide which fits nicely in the track of the upright. All of the above parts are given a coat of shellac, sanded, and sur-





faces exposed to the enlarging light are coated with dead-black wallboard paint.

The lamp house is designed to utilize the illuminating power of the lights to the utmost. Heavy cardboard is glued inside of a wood frame, as shown in Figs. 1, 2 and 3. Both sides are made fireproof by coating with water glass, which is also used to attach sheets of crinkled tinfoil. The lamp sockets are bolted inside of aluminum drinking cups, 3 in. in diameter. Flashed opal glass is used to diffuse the light evenly. If this glass is not available, two pieces of plain glass, with a sheet of 16-lb. bond typewriter paper between them, may be substituted. Lamp house and camera holder are counterbalanced by a sliding weight inside the upright. Linotype metal is cast in shallow boxes treated with water glass, and a hole is

drilled in each weight. A sufficient number are strung on a heavy cord, passed over the pulley on the upright and tied to a screw eye on the slide. A hole is drilled in the base of the upright immediately above the plug at the lower end, to enable one to anchor it to a table with a metal clamp.

Any small folding camera may be quickly fastened to the holder. Remove the back and snap it in place with heavy flat rubber bands. In using a box camera, lay aside the outside part and provide a veneer box around that part in which the lenses are fitted. The box is in turn attached to a frame that can be snapped to the camera holder. With cameras of odd design, the reader can easily make a suitable connecting attachment. In use, the camera is shifted up or down until a picture of the desired size is projected on a piece of cardboard laid on the table. Then focus is obtained by moving the bellows, in case you are using a folding camera, or by adjusting the camera, if you have one of the box type in the veneer case, the latter being a rather tight fit to permit such adjustment. Turn off the light, exchange the cardboard on the table for bromide paper and



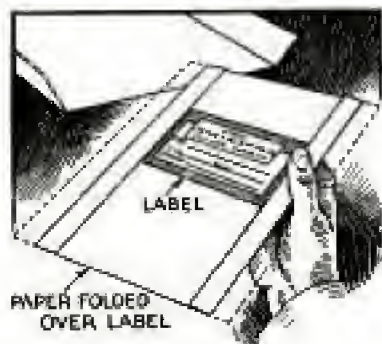
make the exposure. Leave the camera shutter open at all times, exposing only by means of the light switch to eliminate any possible vibration. A good way to mask the space around the negatives is to apply adhesive tape to the edges of the glass in the holder.

Extensive testing of this enlarger has been made and it was found entirely satisfactory. The specifications are correct for any box camera, and for folding cameras up to postcard size. Larger sizes will require a higher upright because of the longer focus of the lens used with them.

### Copperplating without Electricity

A thin coating of copper may be plated onto iron or steel objects by simply immersing the work, for a few seconds, in a solution made by dissolving copper sulphate,  $1\frac{1}{2}$  oz., in 1 gal. of water. When the copper sulphate has dissolved, add commercial sulphuric acid, 1 fluid oz., pouring the acid into the solution slowly to avoid spattering. Before immersing the work in this solution, it should be thoroughly cleaned by boiling it for a few minutes in a strong lye solution. When clean, rinse and dip into the copper solution. While a plate made in this way is thin, it is suitable for a variety of ornamental purposes.

### Typing Small Gummed Labels



PAPER FOLDED OVER LABEL

Small labels may be typed near the bottom edge by using the method indicated. A sheet of paper is folded at the edges to fit over the ends

of the label. By placing the sheet in the typewriter in the usual way, the folded edges hold the label as it is run through the machine.

☛ A knife blade whetted on a strip of No. 90 emery cloth will cut soft materials such as felt, leather and soft rubber more effectively than one that has been honed to a smooth fine edge.



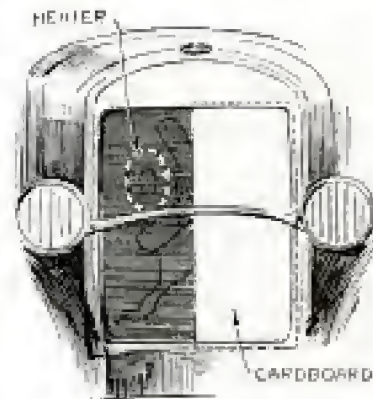
Emergency Double-Line Ruling Pen Made by Inserting Ordinary Ruling Pens in Side of Box

### Double-Line Ruling Pen Improvised from Cardboard Box

For emergency use, a double-line ruling pen can be improvised from a small cardboard box and two ruling pens. Holes are punched through opposite sides of the box to take the pens as shown. If lines of various spacings are to be ruled, it will be necessary to make a box for each one.

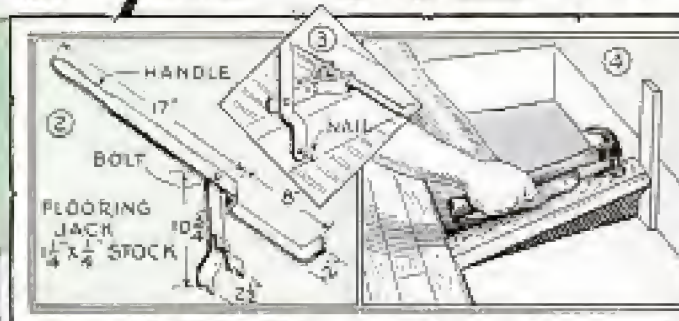
### Cardboard on Side of Radiator Improves Heater

When attached to the side of a radiator opposite the exhaust heater, a piece of cardboard will not interfere with the efficiency of the heater, as is often the case when it is placed across the bottom. If it is necessary to cover still more of the radiator to maintain the proper motor heat, be sure to leave an opening just in front of the air intake of the heater.





# It's Easy to fit NEW



REFLOORING offers considerable scope to the home craftsman, with as many as a dozen easily worked materials to select from. No special skill is required to lay wood flooring beyond the ability to hit a nail squarely on the head. It may be nailed directly to and across the beams over the subflooring, or laid over old floors or matched subfloors.

Each of these methods has several things in common as regards the manner of fitting, one of the most important features being the proper handling of warped boards. Care should be taken to prevent this. The flooring should not be delivered until the last minute, and no deliveries should be made when rain is falling. No storage place other than a warm, dry room should be considered. In spite of all these precautions, some boards will warp. To fit them properly, use the simple flooring jack shown in Figs. 1 and 2. If the hooked arm will not fit around the beam, use the nailing method indicated in Fig. 3. When the joists are not accessible, the simple method shown in Fig. 4 can be used to good advantage, gradually shortening the

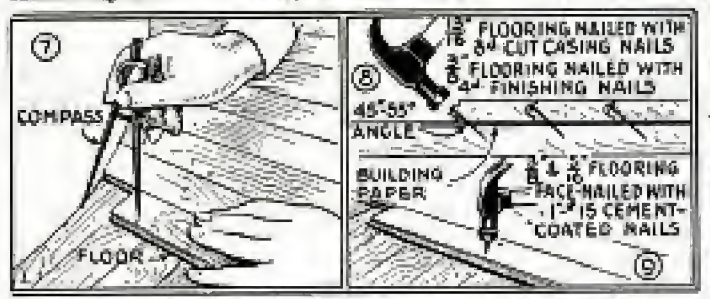
"pressure board" for succeeding strips. Even with these methods, you should not attempt to force a board; a  $\frac{1}{2}$ -in. twist will pull up and stay tight if well nailed, while a 1-in. twist will gradually open up again after being laid tight. Use the short lengths and warped pieces in closets and out-of-the-way places, reserving long straight boards for doorways, exposed surfaces and large areas. If the warp is in the joist, it can be taken out by nailing a piece of 2 by 4-in. stock across the beams. This will hold a slight twist in place where the individual boards would be insufficient to bring the beams level. In a solid unit, of course, the flooring will hold the level surface after the cross timber has been removed.



6 A SMOOTH, FLAT SURFACE IS ESSENTIAL FOR REFLOORING WITH STANDARD MATERIAL



# FLOORING



Where  $1\frac{1}{8}$ -in. flooring is applied directly to the beams, it is always necessary to remove the old flooring. This is done as shown in Fig. 10, after first removing the base shoe and possibly the baseboard and door trim. The new flooring is applied in the conventional manner, using eight-penny cut casing nails. Each strip is nailed at every beam, driving the nails home at a  $45^\circ$  to  $55^\circ$  angle as in Fig. 5. With some types of tongue-and-groove flooring, the nails can be hammered in their full length without danger of marring the edge of the wood; with other types, the final  $\frac{1}{8}$ -in. portion must be driven home with a nail set.



Hardwood flooring of  $1\frac{1}{8}$ -in. thickness is usually tongued-and-grooved all around. For this reason, the end cut from one strip should always be used in starting the

next, leaving the grooved end in place for the succeeding board. Joints may occur anywhere, provided two side-by-side strips do not join directly in line. The important point here is that you need not butt the stock directly over a beam, since a joint between two beams will be held solidly by the tongued portion of adjacent boards.

Fig. 11 shows the best type of common floor,  $1\frac{1}{8}$ -in. hardwood, being applied over diagonal subflooring. The procedure in cutting, fitting and nailing is much the same here, with the exception that a layer of waterproof building paper is laid between the two courses. For second-story work, a layer of building felt should be added for insulation, but not on the first floor because of its absorbent quality. For







best results, nail onto and also between the beams, drawing lines on the building paper to show where the joists are located.

Reflooring directly over old floors is increasing in popularity because of its simplicity. This is especially true where ready-finished flooring is used. The first step in this work has to do with the old floor. It must be as nearly level as possible, and all projecting boards should be planed or nailed down, as shown in Fig. 6. After that, remove the base shoe or quarter-round molding on the baseboard, the building paper and building felt, and lay the new flooring. This will be standard  $\frac{3}{4}$ -in. stock, tongued-and-grooved in as many as a dozen different ways as featured by different manufacturers. The ends of the boards are usually not grooved, but are simply butted tightly together. Use four-penny finishing nails, blind-nailing in the same manner as described for the thicker flooring, Fig. 8. Where a single room is being re-floored, it is necessary to bevel a strip, as shown in Fig. 13, in order to make a suitable threshold strip. As there is no final edge on this piece, it must be face-nailed, using 1-in. No. 15 cement-coated nails, as shown in Fig. 12. The nails should be set and the holes filled with wood filler to match the wood. The flooring should not be laid tightly against the baseboard, but a clearance of about  $\frac{1}{8}$  in. is left for ex-

pansion. The opening, of course, is covered by the base shoe. Visible butting joints, such as around a bathtub or curved stair riser, should be a tight fit. A simple method of determining the proper curve is indicated in Fig. 7, the board being slipped into place and the arc scribed with a compass.

Rubber tile is a comparatively new flooring medium which is especially suited for the bathroom, sunroom or kitchen. In its simplest form, the individual tiles are laid in a square-block pattern, as in Fig. 14. Much of the success of such a floor depends on the under surface. This should be as level as possible, clean and dry. Over the floor, a layer of  $1\frac{1}{2}$ -lb. building felt should be tacked or cemented, butting all joints and covering the area carefully to within  $\frac{1}{4}$  in. of the edges. The tiles should be laid in a waterproof cement provided for this purpose. A tight bond is established by going over the finished floor with a weighted roller or with a common rolling pin, plus pressure, as shown in

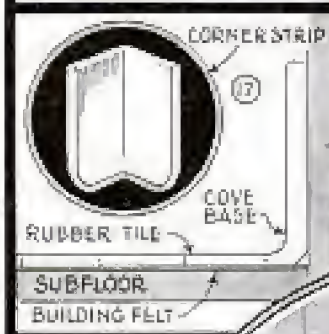
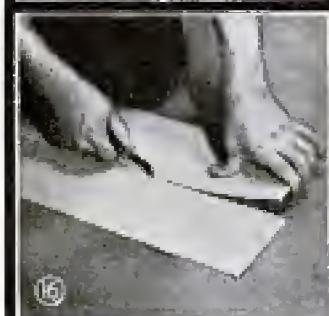
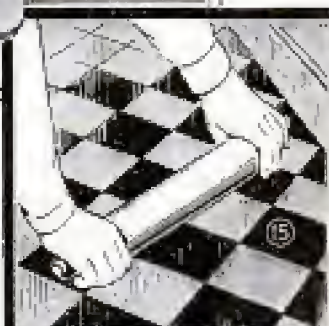


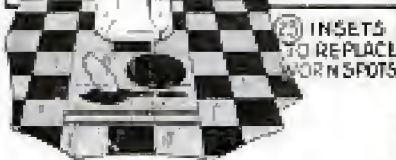


Fig. 15. Besides the square 6-in. blocks, rubber tile is supplied in a wide variety of shapes and colors, with plain-colored strips for border effects. These strips can be cut with a roofing or linoleum knife, as in Fig. 16, or with a fine circular saw. A sanitary cove base, with molded corner strips, as in Fig. 17, is often used in connection with the flooring in

ways show the board lines and eventually the board itself as the linoleum cracks and chips away. The only correct way is to see that the floor is as smooth as possible. Building felt, of a good weight, should always be used under the finished floor. This may be tacked or cemented down as



20 WHEN LINOLEUM IS CEMENTED IN PLACE, SAND BAGS OR OTHER WEIGHTS ARE LAID OVER SEAMS UNTIL CEMENT IS DRY



21 INSETS TO REPLACE WORN SPOTS



suits the job. Best results are obtained by cementing the linoleum to the felt base, covering the whole surface. The seams, at any rate, should be properly coated with waterproof cement, as in Fig. 19. The manner of edging the linoleum against the baseboard is also important. It should never be a tight fit, but should clear the wall by at least  $\frac{1}{4}$  in. When applying the base shoe over the edge, do not nail it tightly onto the linoleum, but slip a strip of light cardboard under the wood and then nail to the baseboard, as shown in Fig. 22, and not to the floor. Laid in this manner, the linoleum has room to expand

order to secure a neater job. Fig. 18 shows the tiles being laid in a diagonal block, using a 6-in. border and a starting course of triangular pieces. Notice here how each block is more or less pushed into place so that a small portion of the cement is carried forward between the seams. Cement projecting above the blocks should be promptly wiped off with a rag soaked in alcohol.

Linoleum floors are often laid improperly, the commonest fault being the lack of the right under flooring. The best grades of linoleum laid over rough wood will al-

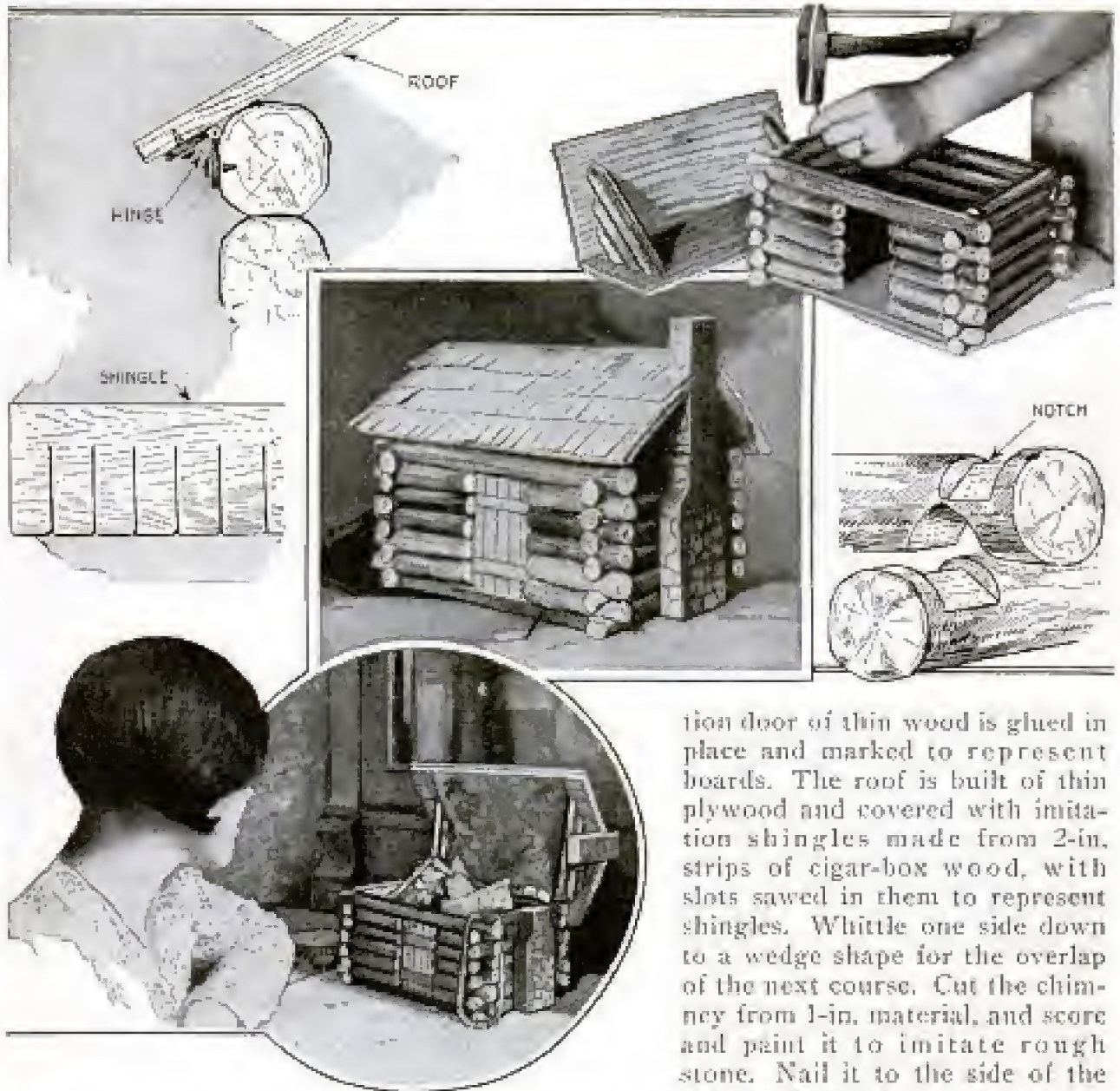
without humping. Linoleum should not be tacked. If you must fasten it by nailing, use  $\frac{1}{4}$ -in. No. 18 wire brads, driving these in until the heads are just lost in the

(Continued to page 121A)

Sealer (Congoleum Haircloth) Kearny, N.J.



# Novel Jewel Box Resembles Pioneer Cabin



Resembling an old-fashioned log cabin, this jewel box is made from small green twigs, about  $\frac{3}{4}$  or 1 in. thick, with the bark left on. Cut twelve pieces, 11 in. long, for the sides and an equal number, 8 in. long, for the ends, while varying sizes are used for the gables. The pieces for the sides and ends are notched deeply enough for the logs to fit closely together when fitted. The height of the sides, when assembled, should be about 6 in. The twigs are assembled by nailing them with lath nails, each to the one below it. Avoid nailing near the corners, or the pieces may split. The doorway is 2 in. wide, leaving the top and bottom logs intact. An imita-

tion door of thin wood is glued in place and marked to represent boards. The roof is built of thin plywood and covered with imitation shingles made from 2-in. strips of cigar-box wood, with slots sawed in them to represent shingles. Whittle one side down to a wedge shape for the overlap of the next course. Cut the chimney from 1-in. material, and score and paint it to imitate rough stone. Nail it to the side of the cabin and cut it in two, so that the

upper half will rise with the roof when the box is opened. Hinges complete the assembly. Wood filler is used to calk the cracks. A lining for the inside of the box can be made of cardboard which may be covered with fancy cloth. No paint or varnish should be used for the walls, but the roof, door and log ends should be stained to represent weathered wood.—Paul Hadley, Piggott, Ark.

☛ Cardboard boxes and paper bags can be waterproofed by painting them with a dilute solution of casein glue; when the glue has dried, paint the surface with formaldehyde.



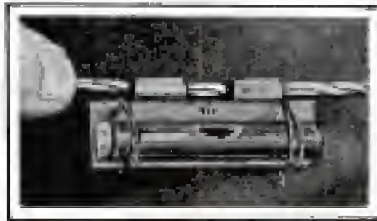
### A Polish to Preserve the Finish on Your Car

The owner who spends many hours polishing the surface of his car will appreciate this formula for a polish that requires no rubbing. Mix clear spar varnish,  $\frac{1}{2}$  pt., in high-test gasoline,  $1\frac{1}{2}$  pt., and to this add turpentine, 2 oz., and raw linseed oil, 1 oz. After the car has been washed and dried, apply the polish with a pad of cheesecloth, keeping the pad saturated so that the polish almost flows onto the surface of the car, but do not rub it in. Apply the polish quickly and do not go over the same area after the polish begins to dry. It dries completely in a couple of hours, depending on weather conditions. After the polish has dried, wash with cold water to harden and set the varnish, and then dry off with a chamois.

### Pill Bottle Used as Line Level

A simple level for determining the true horizontal position of a wall chalk line can be made from a small pill bottle attached to one-half of a common butt hinge. The bottle is first filled with liquid, allowing space for a small air bubble, and then tightly corked, after which it is wired to the hinge, parallel to the lower edge. The line is threaded through the pinholes

of the hinge, which permits it to be moved in either direction. Marking the exact center of the hinge on the

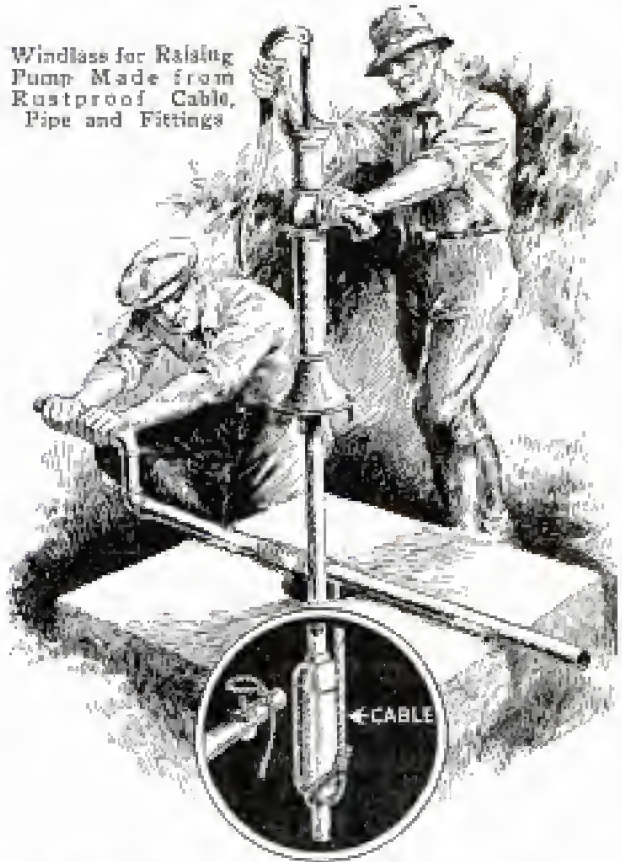


top edge will aid in determining when the air bubble indicates levelness.

### Small Block Aids in Playing Guitar

Guitar players often break the E-string by using it as a rest for supporting their fingers in strengthening the base notes. To avoid this, they will find the following method helpful. Glue a block,  $\frac{1}{2}$  in. square and 2 in. long, to the guitar 3 in. from the bridge, and just beside the E-string. It will then take but little practice to become accustomed to pulling on the block instead of the string.—Geo. Maxwell, Kimmswick, Mo.

Windlass for Raising  
Pump Made from  
Rustproof Cable,  
Pipe and Fittings



### Simple Device for Lifting Pumps Made from Pipe and Fittings

As pumps must be lifted from a well frequently for making repairs, this ever-ready lifting device will be found handy. It consists of a long crank, assembled from pipe and fittings, and a length of rustproof cable. When the pump is taken out, one end of the cable is looped around the pipe below the cylinder and the other end anchored to the platform. When the pump is to be lifted the next time, the cable is simply wound on the crank.

### Groove in Smoking Pipe Provides Place to Scratch Matches

By filing a small groove on your pipe as shown, you will always have a convenient place for scratching matches. The groove, which

is just wide enough to receive the head of a match, is started with a three-cornered file and finished with a round one. It is then lined with emery cloth.





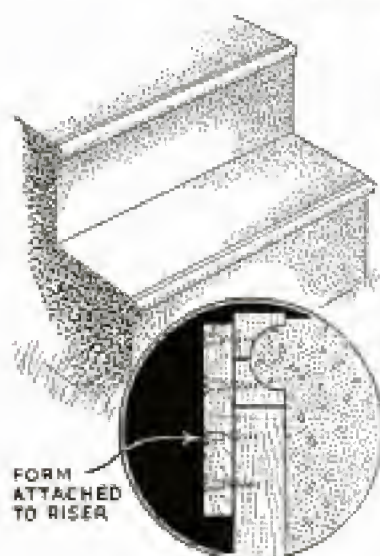


Tire Valve in Sink Stopper Allows Air to Be Forced into Waste Pipe

### Tire Pump Clears Sink Drain

By fastening a valve from an old inner tube to the rubber stopper in a sink, the drain can be cleared by forcing air into it with a tire pump. The part that holds the ring on the stopper is cut off and a hole is drilled through its center to take the valve. When the altered stopper is put in the sink and held firmly, air can be pumped into the pipe to force out accumulations that clog it.—Ray J. Marran, Kansas City, Mo.

### Quarter-Round Molding Forms Nosing on Concrete Steps



Two lengths of quarter-round molding, nailed together to form a semicircle, and screwed to the forms by means of a cleat, as shown in the detail, make good forms for nosings on concrete steps. After the forms are

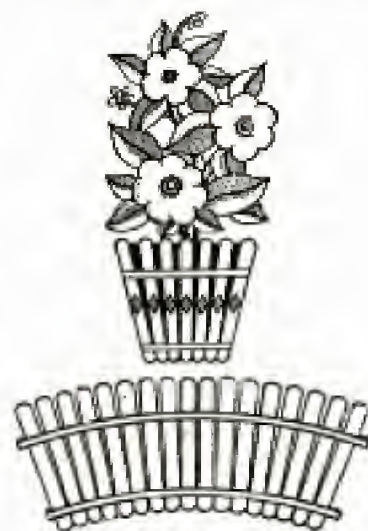
removed, any ridges, caused by the cement leaking through the cracks between the molding strips, can be chipped off or dressed down with a file.

### A Strong Quick-Setting Cement

A quick-setting cement for metal, glass or wood may be made by mixing dry white lead with thick orange shellac to form a heavy paste. The lead should be worked into the shellac with a putty knife and a piece of plate glass may be used as a mixing table. This cement will set in a short time, and will be hard enough to be carved, filed and sandpapered. If colored cement is desired, add a suitable quantity of dry color, or color the shellac with spirit stain or aniline dye before adding the white lead.

### Easily Made Flowerpot Cover

Here is a flowerpot cover that can be folded up and put away when not in use. It consists of wooden tongue depressors, obtainable at any drug store, held in position with strips of adhesive tape as indicated. The lower strip should be about  $\frac{3}{4}$  in. from the bottom and the upper one about  $1\frac{1}{2}$  in. from the top. Two more strips are placed in the same position inside of the cover, and the ends are joined to the ends of the strips on the opposite side. Any kind of narrow strips, cut from thin stock, may be used instead of the depressors.



### Waterproofing a Cracked Car Top

When I found the top of my car cracked so badly that it seemed almost beyond repair, I coated it with roofing paint, which filled the cracks and made it waterproof. Before using, the paint should be thoroughly warmed so it will flow into the smaller cracks. Apply as many coats of paint as necessary to fill the cracks and leave a smooth surface, allowing each coat to dry before applying the next one.—Eugene Allford, Decatur, Ala.



# Sovereign

## of the Seas

By HAROLD T. BODKIN

Charter President of the Ship Model Club of Chicago

### PART II—The Rudder, Quarter Galleries and Gunports

AFTER carving the hull to shape as covered in the November issue of *Popular Mechanics*, you will need two main-deck bulwarks to build up the ship's sides just below the spar deck. The bulwarks are simply two strips of white pine, each 6 by  $\frac{3}{8}$  by  $\frac{1}{8}$  in. in size, as shown in Figs. 29 and 30. Into each of these pieces cut five gunports,  $\frac{5}{16}$  in. square, beginning with the center



gunport and locating two more ports on either side. All of the ports should be located so that they come exactly  $1\frac{1}{8}$  in. center to center. This done, mix a little casein glue, and with it attach to each bulwark two  $\frac{1}{8}$ -in. square reinforcing pieces of wood, flush with each end, top and bottom as in Fig. 30. When dry, glue the bulwarks in place as shown on the general assembly, Fig. 28. The reinforcing pieces should be inboard, of course, and the outside of the bulwarks should be flush with the ship's side at the main deck level. Sandpaper the juncture of the bulwarks and the hull side so that the hull curve will flow smoothly into the bulwark face.

Now, we again take to carving. Beginning with the top row of gunports, draw pencil squares,  $\frac{5}{16}$  in. on a side, to define the gunports to be cut next. The top line of ports is on the horizontal center line of the bulwark gunports. In the next row below, the gunports are centered along

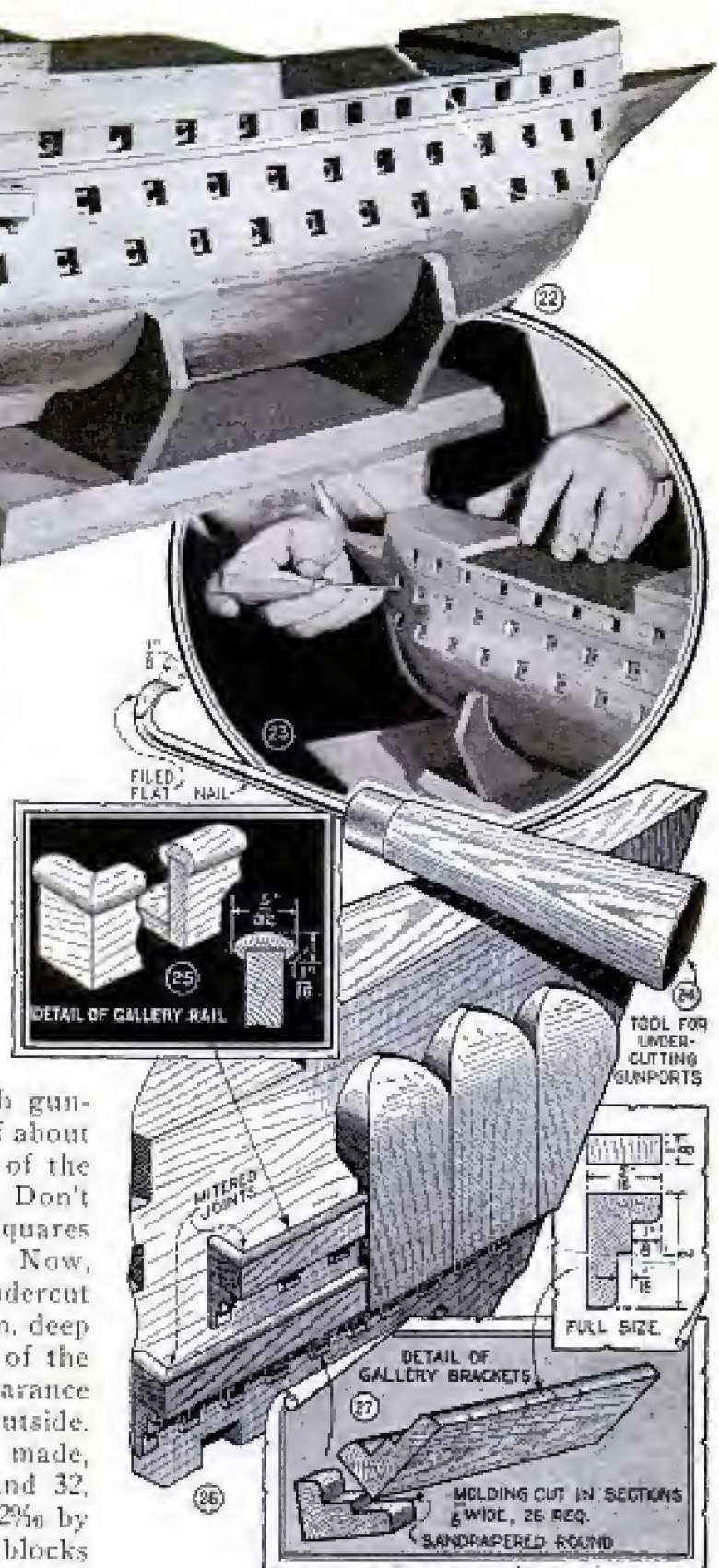


This View Shows the Gunports Cut and the Stern Fitted with the Rudder and Quarter Galleries

lift No. 6 of the hull. The lowest ports have their bottom edges flush with the bottom edge of No. 5 hull lift. Fig. 28 shows how the gunports of each line are staggered and gives dimensions for locating the gunports in each line. Check your complete pencil layout again to be sure that each port is correctly placed, before you begin to cut.

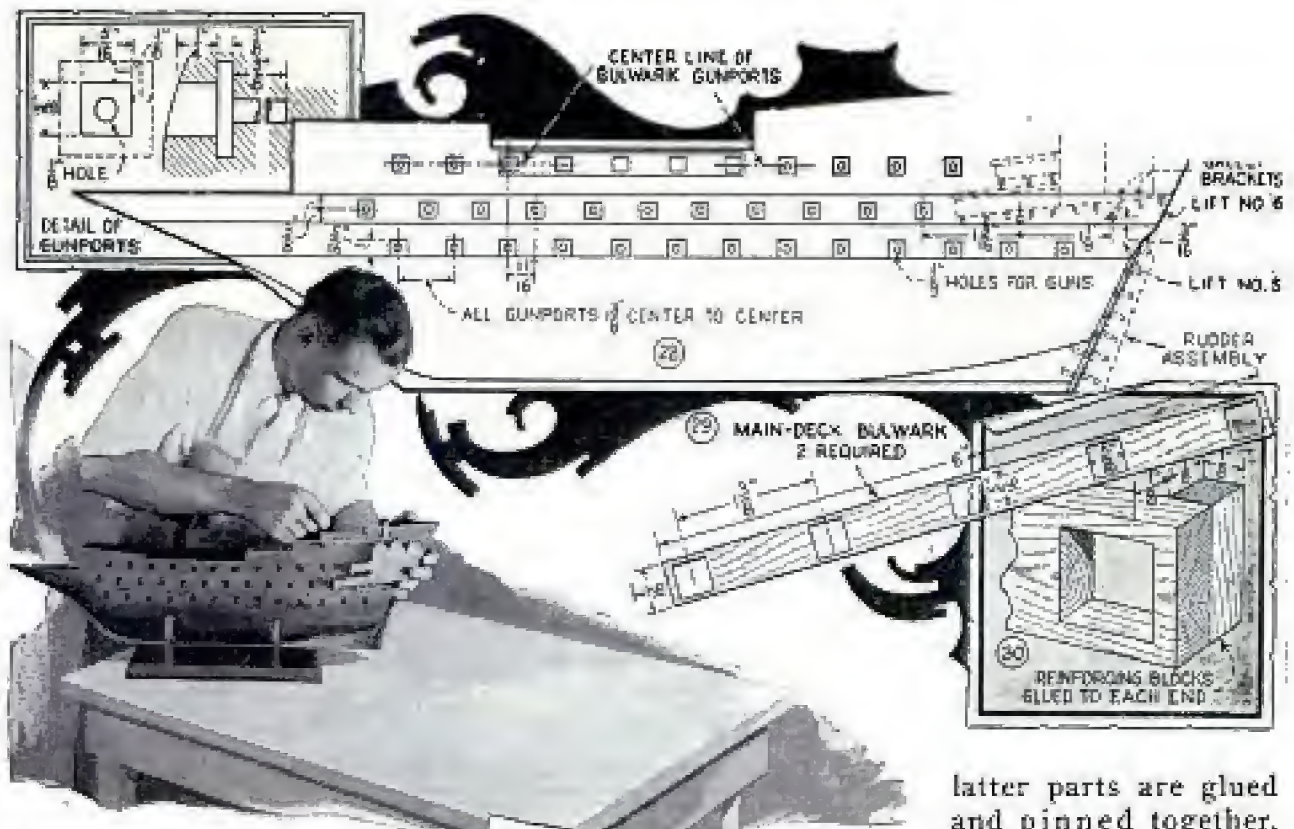
With a very sharp jackknife, cut deeply along each side of each gunport as marked. Then, use a  $\frac{1}{4}$ -in. carpenter's chisel to sink the holes. These must be cut into the hull squarely to a depth of  $\frac{3}{8}$  in. In the exact center of each gunport, drill a  $\frac{1}{4}$ -in. hole to a depth of about  $\frac{3}{8}$  in. to receive the inboard ends of the guns, which will be described later. Don't overlook the two holes without squares just under the quarter galleries. Now, make a tool, shown in Fig. 24, to undercut all sides of each gunport about  $\frac{1}{8}$  in. deep as in Figs. 23 and 24. The object of the undercut is to produce a hollow appearance of the interior as viewed from the outside.

Two quarter galleries are next made, one for each side; see Figs. 26 and 32. From white pine, cut four blocks,  $2\frac{3}{4}$  by  $1\frac{1}{2}$  by  $\frac{1}{2}$  in. in size. Cut two more blocks of the same thickness, but  $2\frac{3}{4}$  in. long and  $1\frac{1}{2}$  in. wide. One end of each block is cut dome-shaped as shown. Note that greater curves are cut in the two larger blocks. Now, on the flat back side of two small blocks, measure down  $\frac{1}{2}$  in. from the point where the dome curve meets the

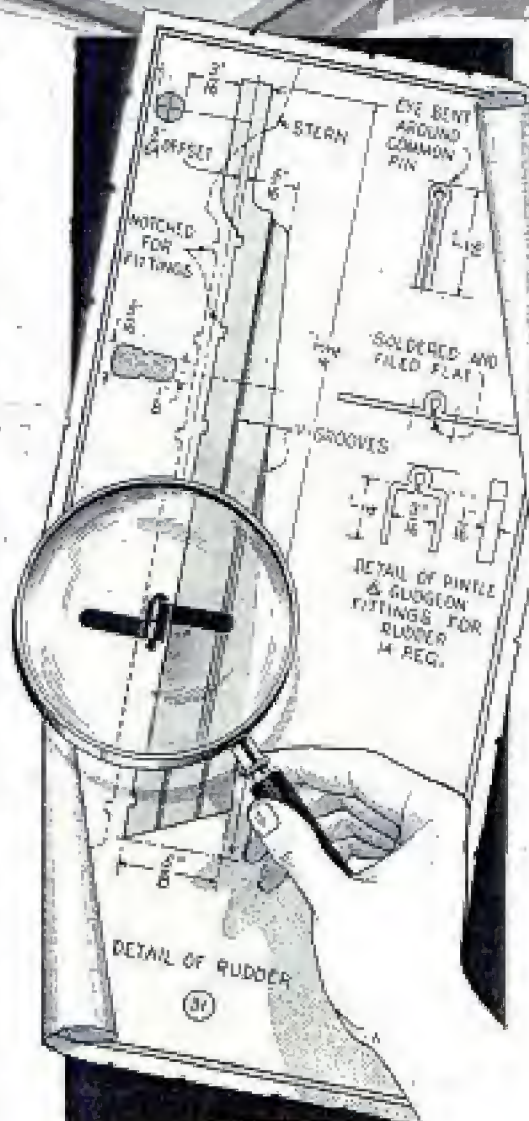


vertical side. Draw a line straight across each piece and, from this point down, cut away the wood so that only a  $\frac{3}{32}$ -in. thickness remains as the outboard side, as shown in Fig. 32. Glue the blocks together, as shown, in sets of three, one large





block between two smaller ones. On one set, glue the cut-away block to the right of the center block; on the other set, glue the corresponding block to the left of the center. The gallery rails, rail tops and decks are made as shown in the quarter-gallery details. Cut the stern angle and the bottom angle in each set of blocks. Then, mortise shallow channels in the inner side of each cut-away and middle block, to receive the parts of the gallery decks that continue aft on their inner sides. You can buy fine pins, called "lills," at your stationery or department store, which provide excellent fastenings for all small parts on the ship, including the decks and rails of the quarter galleries. These

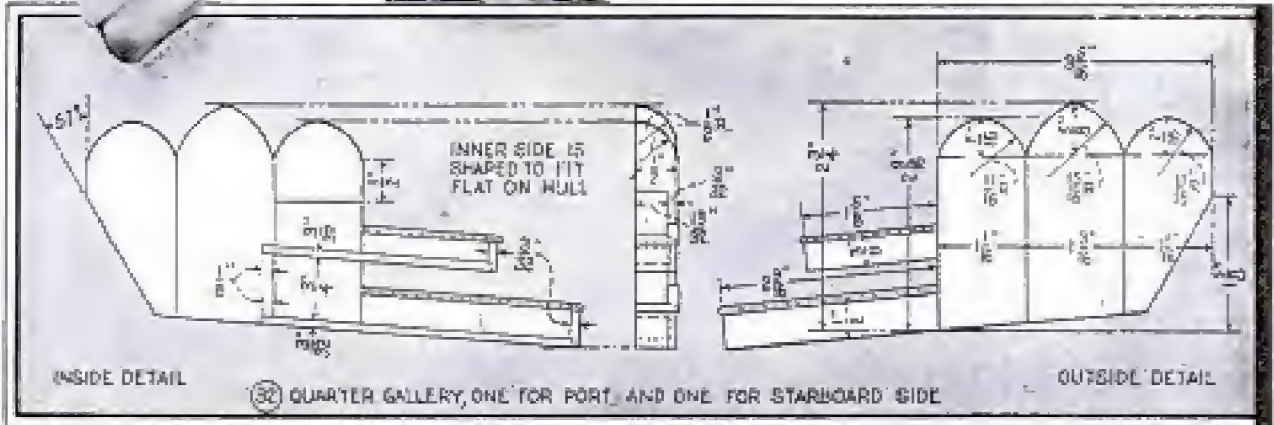


latter parts are glued and pinned together.

Drive the lill pins partly into the wood, cut off the heads and drive in flush with a light ball-peen hammer. This will produce another smaller head on the pin, which is sufficient to grip the wood securely.

When you have completed the quarter gallery assemblies—one right and one left—you will have to fit the inboard side of each to the curve of the hull and upper works. Do this with a jackknife or chisel and finish with sandpaper. If the galleries are correctly fitted, they should butt flush against the hull at all points of contact. The general assembly drawing, Fig. 28, shows where the galleries are attached to the ship. The best way to do this is to apply glue to all contact surfaces, clamp galleries, one at a time, in position and make the initial fastening





with  $\frac{1}{16}$ -in. wood dowels, driven through holes that go through the two solid gallery blocks and into the hull on each side. After this, you can use bolls to secure the decks and rails where they meet the hull.

You can make the gallery brackets while the glue on the two assemblies dries. It will save time if you form these as molding strips from  $\frac{5}{16}$  by  $\frac{1}{2}$ -in. square white pine. Make lengthwise cuts and sandpaper the curved edges of the sticks as shown in the detailed drawing of the gallery brackets, Fig. 27. Then cut  $\frac{1}{4}$ -in. sections from the molding to make the individual brackets. After cutting, carefully sandpaper off any fuzzy edges left by the saw on the brackets, as this will detract from their appearance when on the ship. Twenty-six brackets will be required, three to be equally spaced on the underside of each gallery deck, and ten spaced out under the lower gallery deck. It will be necessary to change the right angle of the backs of the brackets so that they will fit snugly against both deck and hull. However, this angle depends upon the exact shape to which you have carved your hull, and so cannot be determined here. Attach the brackets with bils and glue.

Make the rudder, as a single piece, from a good, clear strip of white pine, 5 by 1 by  $\frac{3}{8}$  in. in size. The rudder drawing, Fig.

31, is full size, and, to get the proper offset for the rounded section at the top, trace the outline first on tissue paper and then onto the wood, following the same method you did when laying out the hull lifts.

The aft side of the rudder is cut down to  $\frac{1}{8}$  in. thick; the top, just under the rounded section, is  $\frac{7}{16}$  in. wide from the forward edge, and the bottom measures  $\frac{5}{8}$  in. wide from the same edge. Two shal-

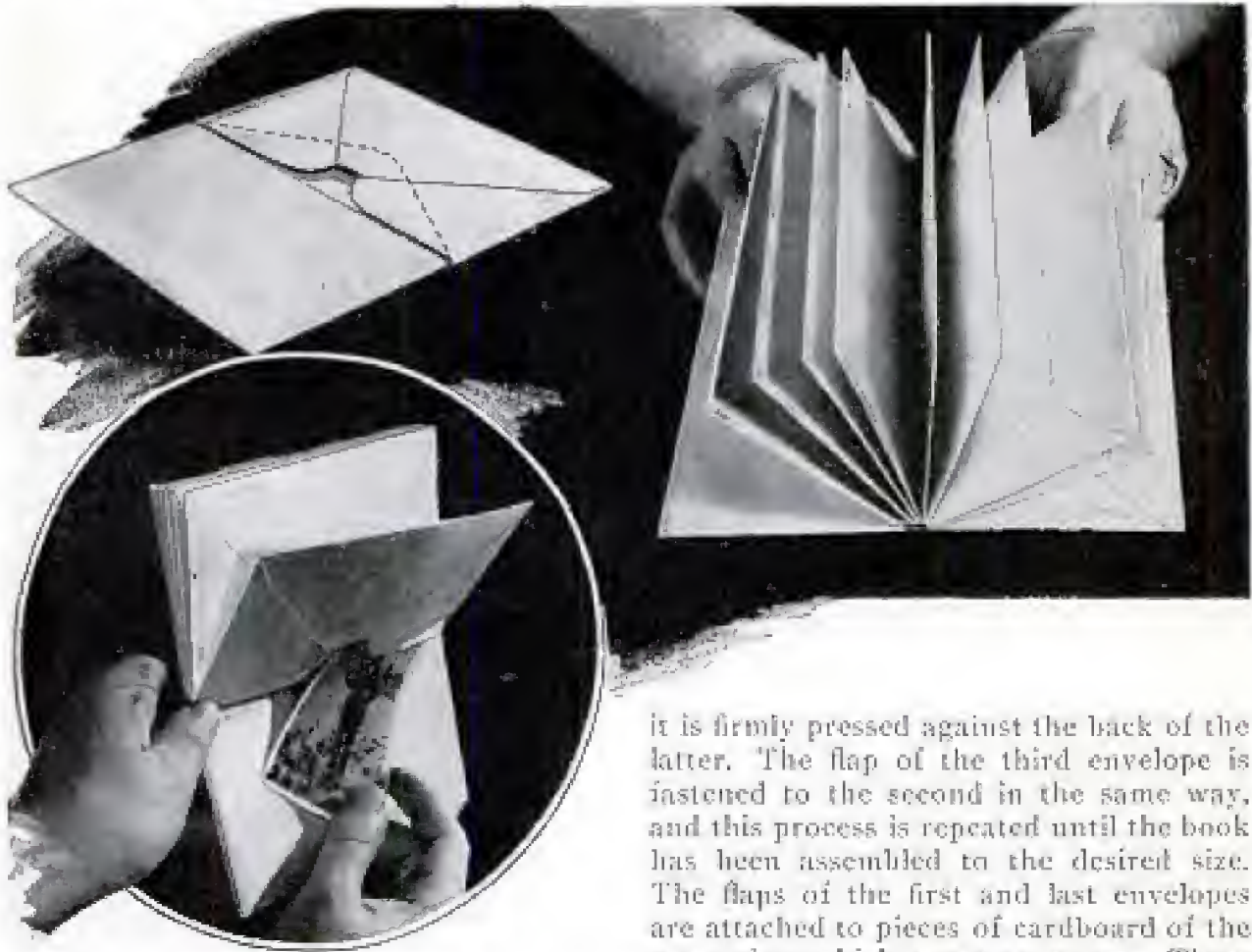
low V-cuts are made parallel to the forward edge from the bottom of the piece to represent planking. Seven notches,  $\frac{1}{16}$  in. wide and  $\frac{1}{2}$  in. deep, are cut into the forward edge, as shown in the same detail, to receive the pintle and gudgeon or hinge fittings, which attach the rudder to the ship. Similar notches are cut into the sternpost, but are staggered below those of the rudder when it is in position. Check the position carefully with the drawing before cutting the notches. When the rudder is attached, the bottom edge must be cut as a continuation of the straight line of the keel. Don't trim this until you have actually hung the rudder, for you may have to make some adjustments—up and down—to get the rudder in the position that looks best to you.

Pintle and gudgeon fittings are next. A flat cigaret tin will provide metal of suitable thickness from which they can be cut. From this, cut 14 strips, each  $\frac{1}{16}$  in. wide and 2 in. long. Bend these in the middle and, using a common pin, form the eye at the upper end of each by putting the pin in the angle and pressing the metal together with a pair of pliers, just under the pin. Further development of these fittings is shown in the details of Fig. 31. Insert a pin in each eye of seven fittings only and

(Continued to page 131A)



## Envelope Book Holds Prints and Negatives



For keeping your prints and negatives together compactly, a simple file can be made from a number of envelopes. The flaps of the envelopes are first turned back, the gummed edge is moistened, and it is then inserted into the next envelope where

it is firmly pressed against the back of the latter. The flap of the third envelope is fastened to the second in the same way, and this process is repeated until the book has been assembled to the desired size. The flaps of the first and last envelopes are attached to pieces of cardboard of the same size, which serve as covers. There is, of course, no limit to the size of books that can be built up in this way, either in the number of envelopes employed or in the size of the envelopes. With rubber bands snapped around the file, there will be no risk of losing any prints.

### Repairing a Leaky Hot-Water Coil

A temporary repair for a small hole in a copper hot-water coil can be made by driving a steel carpet tack, or a small nail, into the opening. As copper is softer than steel, it will spread and fit snugly around the tack.—S. E. Schofield, Indianapolis.

### Long Strips of Punch-Press Work Straightened by Hand

Punch-press operators can straighten strips of light sheet metal that have become bent on the press, by merely taking them at one end, individually, and slapping them against a flat surface, such as that of an I-beam. If one blow does not

suffice, grasp the strip by the other end and strike again.

### Glass Cutter Used as Ruling Pen



By filling the small cavity just above the wheel of an ordinary glass cutter with cotton and saturating this with ink, the tool can

be used as a rotary ruling pen. The sharp edge of the wheel is inked by the cotton, and makes a neat line on the paper.





Sheet-Metal Scraper Prevents Accumulation and Packing of Snow in Front of Door

### Scraper Keeps Snow from Blocking Door in Winter

Bent at right angles and screwed to the bottom of a door as indicated, a strip of sheet metal will scrape snow away when the door is opened. The scraper should extend just a trifle below the bottom of the door so that enough snow will be removed to assure sufficient clearance. Besides preventing the snow from becoming packed so the door cannot be opened, the scraper also keeps water from running down the outside of the door and freezing under it.

### Method of Fitting Wristpins

Although considerable information on the proper clearances for fitting wristpins is available, the following method has been found a safe way of doing the job. Fit the pin just tight enough to hold the weight of the connecting rod when the piston is held in the position shown, but not so tight that it will stick when the piston is given a slight jerk.



A Simple Method of Determining When a Wristpin Is Correctly Fitted

### Simple Trick to Discourage Theft of Auto Tires

An auto owner who had several tires stolen from the wheels of his car used the following idea to discourage the thieves. When new tires were put on the wheels a 1-in. strip of canvas, about 8 in. long, was allowed to project between the tire and the rim of each wheel to imitate a blow-out patch, leading the thieves to believe that the tires were in poor condition. A little mud smeared over the tires will help increase the deception.

### Crack Filler Made from Sawdust

When working with any kind of wood, run some of the sawdust through a fine colander or sieve and mix it with enough white shellac to form a paste, which will make a crack filler the same color as the wood. The filler is quick-drying and, when smoothed down with fine sandpaper, will hardly be noticeable.—Paul D. Miller, Topeka, Ind.

### Utilizing Waste Pieces of Soap

Scraps of toilet soap can be utilized by slipping them into a slit cut in the center of a rubber bath sponge. This arrangement also makes better lather than is obtained by rubbing the soap on the sponge. All that is necessary to remove the soap is to squeeze the sponge.



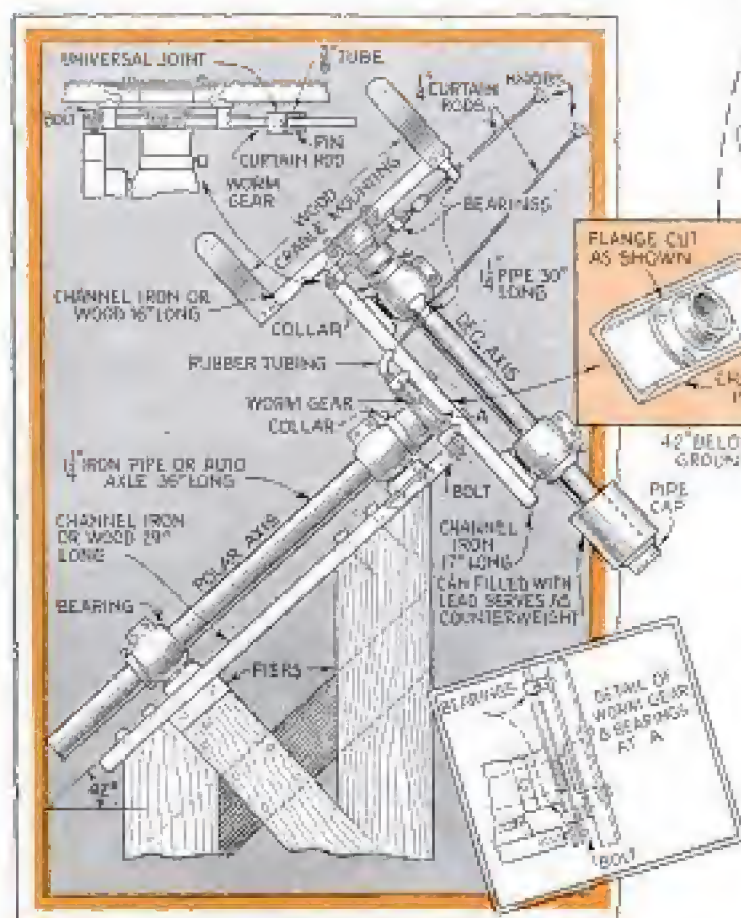
### Ducks Retrieved with Casting Rod

When shooting wild ducks, a casting rod will be found handy for retrieving them. About 50 ft. of line is used on the reel in connection with a wood casting bait of the floating type. When a duck is shot and drifts in close enough to the boat, cast out over it and reel in.—I. H. Motes, Chicago.



# Adjustable TELESCOPE MOUNTING

HERE are two forms of telescope mountings that can be made by any home craftsman. The first, shown on the left, is the simpler of the two, as it has no worm-gear control, but is moved about in two directions manually. It consists of a pier built up of 4 by 6-in. uprights, tied with 2 by 4-in. stock, and is set into the ground about 42 in., where a crosspiece forms a secure anchor. The tops of the piers are cut off at a 42° angle and a piece of channel iron or wood is attached with



lag screws. This base carries two bearings for the polar axis, which is a length of 1 1/4-in. pipe. A pipe flange is screwed to the upper end and two collars hold it in place. The declination axis and its mounting are made in the same way, the only difference being the addition of a lead-filled can at the lower end, which serves as a counterweight, and a wooden cradle at the upper end to hold the telescope. The right-hand detail shows the same type of mounting to which worm gears have been added.



This addition consists of 1/4-in. curtain rods held in bearings and fitted with worm gears that mesh with gears slipped over the ends of each axis but not fastened to the latter. The gear on each axis is fastened rigidly to the axis support, directly underneath as indicated, so that it will not turn. This arrangement permits the worm to work around the gear, rotating the part directly above the gear and also the axis to which this part is attached.—Geo. H. Olewin, Chicago.

## Polish for Gold and Silver Articles

A good polish for gold, brass, nickel and silver is made by mixing kerosene with finely powdered crocus to form a creamy paste. Apply the paste with a soft cloth, and finish the polishing with a clean flannel.





#### Rocker Support on Large Jugs Facilitates Handling

When pouring the contents from a large jug, it is much easier to handle if the illustrated rocker support is provided. The rocker may be made from either heavy galvanized wire or a small iron rod. The method of attachment is clearly shown in the upper detail.—Fred W. Schneider, Towaco, N. J.

#### Simple Methods of Removing Ordinary Stains

Here are a few simple methods of removing ordinary stains that are often a problem in the average household. A new appearance can be given to a straw hat by cleaning it with a solution of sodium bisulphite, 4 parts, tartaric acid, 2 parts, and borax, 2 parts. Add water and apply the solution to the hat with an old toothbrush, wipe with a moist, warm cloth and set it aside to dry. The whites of two or three eggs beaten and rubbed over leather chairs with a flannel cloth will remove finger marks from the leather. If it is black, a little lampblack added to the eggs will help. Grease spots can often be removed from cloth by placing a blotter under it and then pressing with a hot iron. This softens the grease and the blotter absorbs it. A piece of ice wrapped in a cloth and rubbed over chewing gum on a garment

will harden the gum so that it can be broken up and brushed off. Stains caused from varnish or cooking fats can usually be removed with benzine. Clothes stained with indelible ink should be soaked in a strong solution of salt water and then washed in household ammonia. Iodine stains will come out if soaked overnight in a heavy solution of starch and water and then washed in the usual way. These stains should be removed as soon as possible as they tend to ruin the material. If you have a gold ring which has been stained with iodine, try immersing it in a solution of sodium bisulphite for about 15 minutes. Rust spots on household utensils will come off when soaked over night in a solution made by dissolving ammonia citrate, 1 teaspoonful, in half a glass of water. Tarnished silverware may be cleaned by boiling it in a clean aluminum pan filled with a solution of baking soda, 1 teaspoonful, and salt, 1 teaspoonful, to each quart of water used. It is important that each piece of the silverware touch the pan. Leather bags can be cleaned with a cloth dipped in a solution of sal-ammonia and water.

#### Forceful Water Stream Cleans Corroded Battery Terminals

Directed onto the corroded parts, a fine stream of water, under pressure, will quickly clean storage batteries. A hose and faucet, on which is screwed a pipe cap with a small hole drilled in its center, is used to direct the water as shown.



Small Stream Directed on Terminals Quickly Removes Corrosion from Storage Batteries

☞ When tossing a flashlight to a companion, be sure to light it; there is then less chance of breaking the filament.



### Alining Telescope Sight on Rifle

The following method of alining a telescope sight on a rifle will be found accurate, and may be used on any rifle where you can sight through the bore of the barrel: First put the gun in a rigid support, and then set up a regulation target or a piece of white paper, with a large "X" drawn on it, at a distance of about 150 yd. from the gun. Place the target so that, when you look through the barrel, it will be in the center of the bore. It will be noticed that the eye will tend to center itself in the opening of the bore. Now adjust the telescope to center on the target. When this is done, the target will appear in the dead center of both the telescope and the barrel of the gun. A slight error may result in elevation if a low-power gun is used, but in a high-power rifle this is negligible.

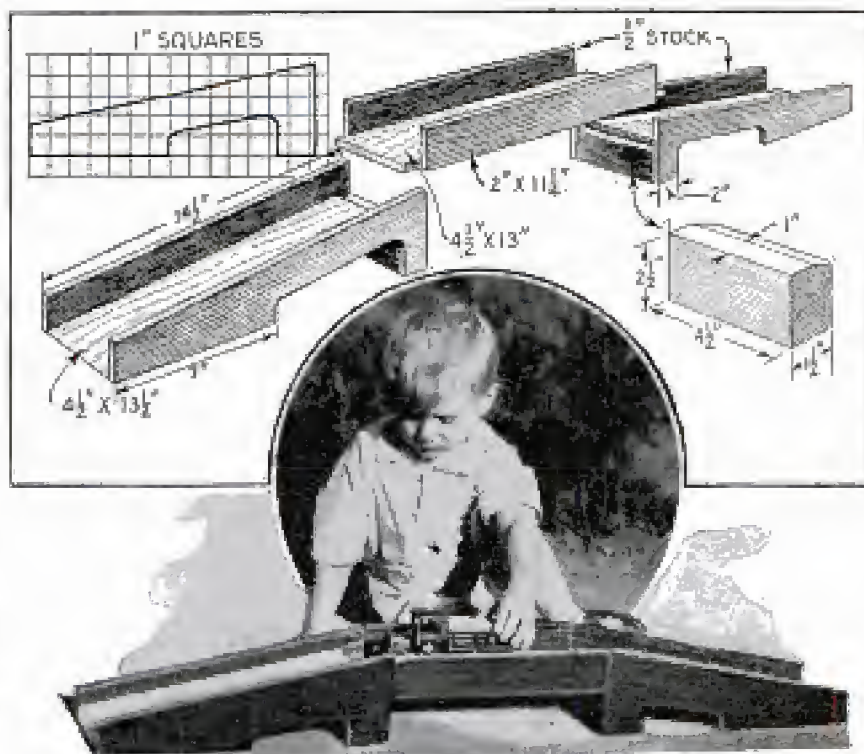
### Trowel Improvised from Auto Pedal



A pedal from an old model-T Ford will be found useful as a trowel for doing concrete patchwork. It is strong enough to press the cement into small crevices, the rounded face of the pedal enabling smooth working of the cement without streaking. It is especially handy when you are working in close quarters.

### Cotton Repairs Honeycomb Radiator

Small leaks in a honeycomb radiator can be temporarily repaired by tamping a piece of cotton tightly into the hole against the leak. The sediment in the radiator will settle in the cotton, and this will soon seal the hole.—Dick Hutchinson, Ithaca, N. Y.



This Toy Railroad Bridge Is 40 Inches Long and Is Built in Three Sections for Ease in Storing

### A Knockdown Bridge for Junior's Toy Railroad

Made in three sections, this wooden bridge is an inexpensive addition to any boy's toy railroad kit. It is made from 1/2-in. stock, except the two blocks which support the ramps. One edge of each block is beveled to fit flush against the floor of the ramps, while the ends of the center section rest on the remaining flat surface. The lower ends of the ramp boards are also beveled so that the upper surface comes flush with the floor.

### Spiked Overshoes Make Effective Ice Creepers

Heavy rubbers or overshoes with sharpened stovebolts, fastened through holes punched in the soles and heels, make good ice creepers. A washer is placed under the head and nut of each bolt to prevent the bolt from digging its way through the rubber.—D. S. Jenkins, Xenia, Ohio.





# LOCOMOTIVE PLAQUE



By FLOYD M. MIX

**M**OUNTED on a dull-black background, this brass locomotive plaque makes a pleasing addition to your living-room wall. It is cut from a piece of  $\frac{1}{16}$ -in. sheet brass, 4 by 19 in. in dimensions. The first step is to make a pattern on a piece of heavy manila wrapping paper, which is done by ruling off the sheet in 1-in. squares and then drawing in the design freehand, or in case you wish to enlarge the design mechanically, this can be readily done by using a pantograph. The sheet is fastened to the brass with rubber cement. It is a good idea to coat the paper with shellac after it has been cemented to the brass, as this will prevent dirt from obliterating the fine lines of the design. As this is a scroll-saw project, it will be necessary to drill one or more holes through each portion of the design that is to be cut out, the holes being large enough to admit the



blades. If possible, use a motor-driven saw, which will enable you to do the work in a fraction of the time it would take if done by hand. Metal-cutting blades for a scrollsaw can be purchased at almost any hardware store.

After the sawing is completed, the rough edges are smoothed down with files. A set of die-makers' files is handiest for this purpose. The flat surface to be exposed



# *of Brass Cut on Scrollsaw*



is then given a high luster. This may be done by first polishing with several grades of emery cloth held on a thick felt or cork pad or a felt-covered block. Use progressively finer emery cloth until all scratches are removed. The final operation may be done on a buffing wheel, using jewelers' rouge. If none is available, you can resort to fine rottenstone and oil. After the rubbing, solder two flat-head brass machine screws to the rear side to project through the backing, which is made later. Apply brass polish to remove all stains and bring out a bright finish, after which a fine badger or camel's-hair brush is used to apply an even coat of transparent metal lacquer.

Be sure all stains and discoloration are removed from the brass before the lacquer is put on.

Mounting the plaque is next. You can use a piece of  $\frac{1}{4}$ -in. plywood, given several coats of dull-black paint or lacquer, or, if you wish, a covering of black velvet. Another suggestion is to get a piece of bakelite or hard rubber brought to a dull finish by rubbing with fine steel wool. The mounting is then set in a suitable frame. The two machine screws on the plaque project through the mounting and nuts are turned on to hold the assembly together, the screws and nuts being invisible from the front.





### Flat-Iron Guide on Ripsaw Helps in Cutting Uniform Strips



Wooden Strips of Uniform Size Are Quickly Cut by Using Guide on Side of Ripsaw

On a job that required a number of wooden strips of uniform thickness, a flat-iron guide was bolted on the side of a ripsaw to eliminate the need of marking off each strip on the stock. The ends of the guide were bent as shown in the detail to provide the proper clearance. The guide also helps keep the saw in a straight line while ripping the strips.

### An Easy Method of Timing Motors

Here's an easy and accurate method of timing an auto motor. Remove the valve-cover plates and spark plug number one. Take a length of wire with which you can feel the movement of the piston through the spark-plug hole and then have someone crank the motor slowly so you can watch the movement of the valves. When the exhaust valve, which is the first one on most motors, just closes and the intake valve, which is the second one, commences to open, piston number one should be on top dead center, or not more than  $\frac{1}{8}$  in. on the downward stroke. If the motor is out of time, remove the radiator and timing-case cover and the timing chain, which permits the cam and crankshafts to move independently. Next place the piston on top dead center and turn the cam-shaft

gear until the first exhaust valve opens and closes, and with the next valve, which is the intake valve, just beginning to open, put on the chain. With the piston and valves in this position, the motor will be timed correctly. If the adjustment on the chain is at the limit and cannot be taken up any more, a link may be taken out if possible, and if not, the chain will have to be replaced. If the cam shaft is gear-driven, the gears are marked with a center punch so they can be correctly meshed. A good way to determine the correct ignition timing of a motor, is to crank it and watch the opening of the last exhaust valve. When it just closes, piston number one will be on top dead center and is ready to fire. Remove the distributor cap or cover, and with the spark retarded, the points should be ready to break for piston number one. If you find them otherwise, loosen the distributor and move it to its correct position.

### Adding Depth to Framed Drawings

Painted on the back of the glass, a silhouetted foreground will add depth to a framed picture of a distant scene. The frame should be made so that there will be about  $\frac{1}{4}$  in. space between the glass



Silhouetted Foreground Painted on Glass of Frame Adds Depth to Prints of Distant Scenes

and the print, and should be hung flat against the wall.





# HANDCAR

## for the *Junior Section Crew*

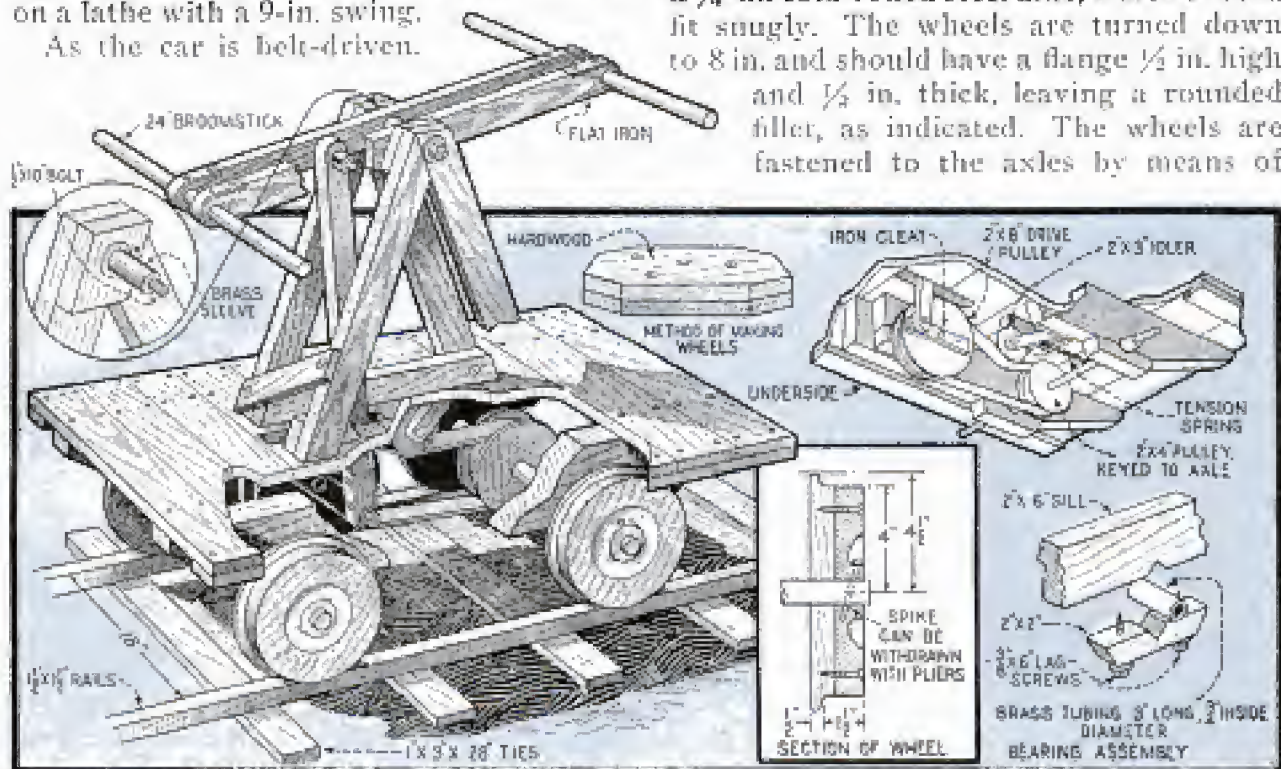
by  
BOB HARDY

TRAVELING on wooden rails laid along the backyard fence or across a vacant lot, this miniature handcar provides a lot of fun and plenty of exercise for the young crew.

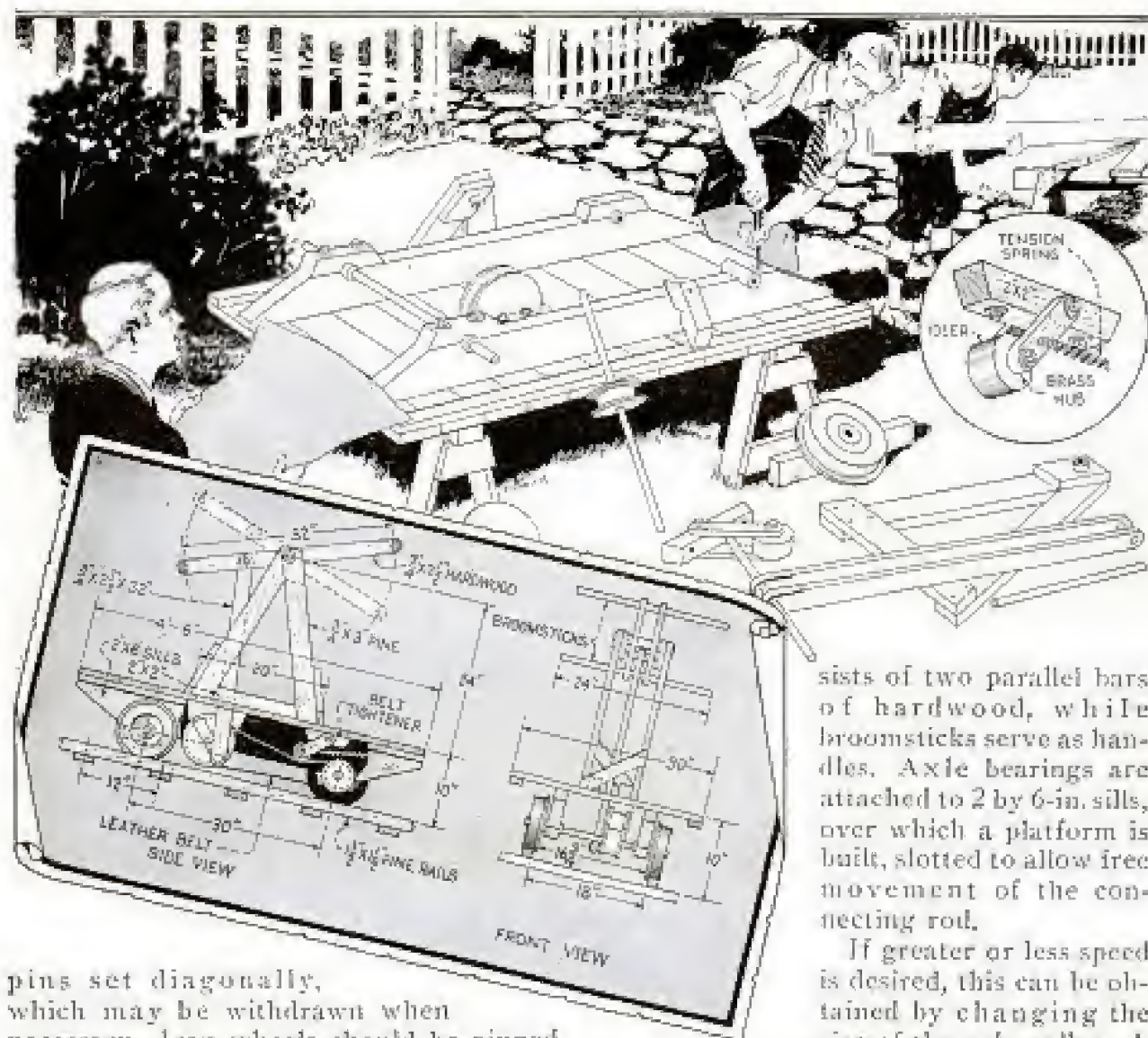
The most important item in its construction is the flanged wheels required. Iron ones may be obtained in junk yards, or you can make them from two pieces of hardwood glued and screwed together with the grain at right angles, and turned on a lathe with a 9-in. swing.

As the car is belt-driven,

it is quiet, and there is no danger of getting one's fingers pinched, as in a gear drive. Also, it is light enough to be lifted off the track. The hub is drilled for a  $\frac{3}{4}$ -in. cold-rolled steel axle, which should fit snugly. The wheels are turned down to 8 in. and should have a flange  $\frac{1}{2}$  in. high and  $\frac{1}{4}$  in. thick, leaving a rounded filler, as indicated. The wheels are fastened to the axles by means of







pins set diagonally, which may be withdrawn when necessary. Iron wheels should be pinned or keyed to the shaft.

The driving mechanism is geared up by providing an 8-in. drive pulley and a 4-in. axle pulley. Both pulleys are 2 in. thick, are made in the same way as the wheels, and should be recessed for a 1½-in. belt. The idler pulley is 3 in. in diameter and is held against the belt by means of a tension coil attached to the swinging bracket. The drive pulley is pinned to its shaft, which turns in a bearing of brass tubing, 5 in. long. A cotter pin and washer keep the shaft from slipping out of the bearing. The crankpin is simply a bolt through the pulley and also through a reinforcing bar of iron, screwed to the pulley. For the connecting rod, a piece of hardwood is used, 30 in. between centers. Each bearing of the rod is bushed with a length of brass tubing to fit the bolt, while the ends of the wood are reinforced with strap iron screwed in place. The walking beam con-

sists of two parallel bars of hardwood, while broomsticks serve as handles. Axle bearings are attached to 2 by 6-in. sills, over which a platform is built, slotted to allow free movement of the connecting rod.

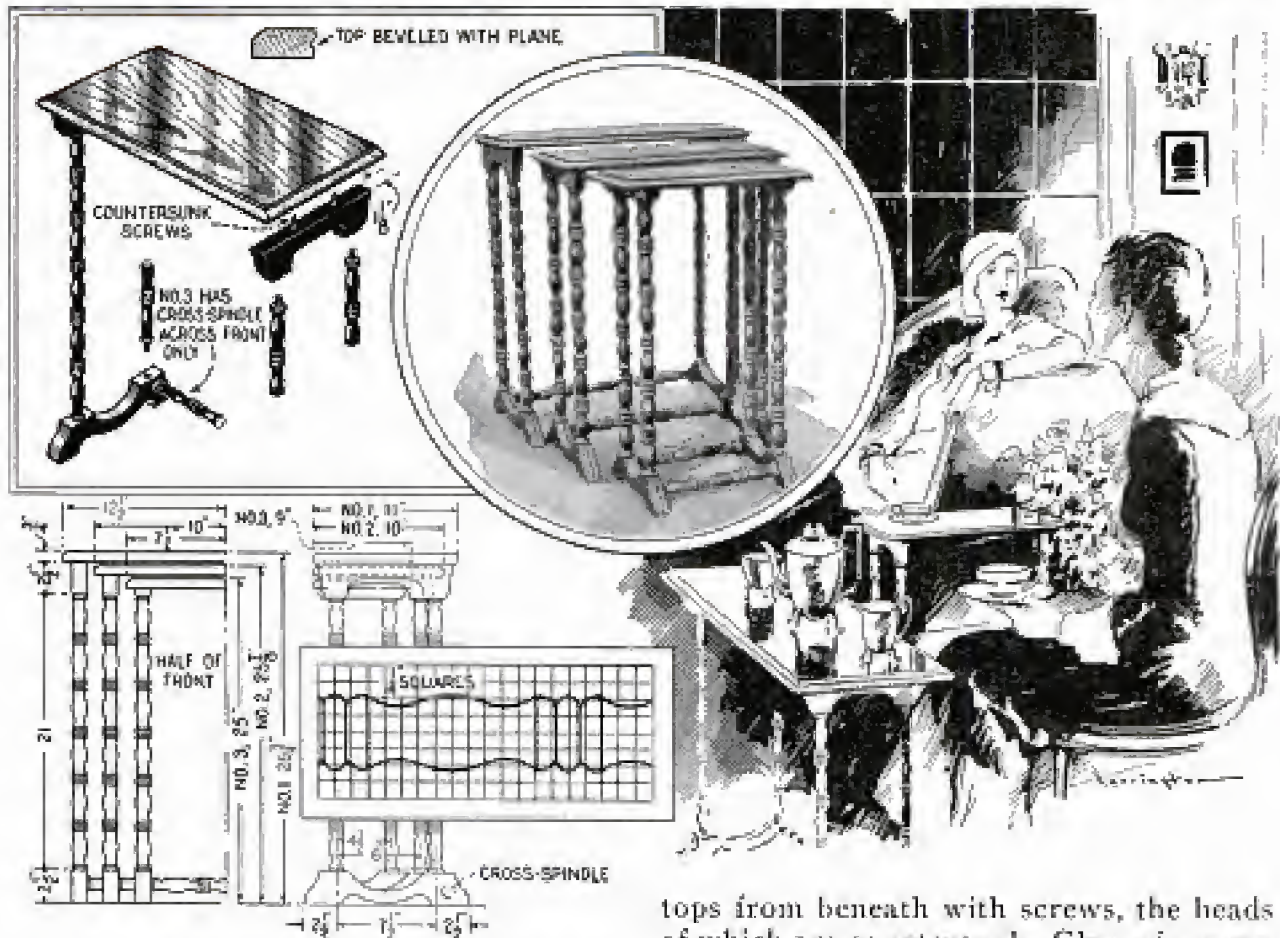
If greater or less speed is desired, this can be obtained by changing the size of the axle pulley. A larger pulley will require less effort on the part of the crew and will develop less speed, and vice versa. If iron wheels are used, a strip of flat iron, screwed to the wood rail, will greatly increase its efficiency and, of course, minimize wear. Curves in the track can be made by using thinner rails than those specified for the straight stretches, and bending them to a long radius.

### Eradicating Ants with a Sponge

To eradicate ants, thoroughly moisten a sponge, ordinary or rubber, with sweetened water and put it where the ants run. They will enter the sponge to get at the sweet water, but it is almost impossible for them to get out of the small passages. The ants are killed and removed from the sponge by immersing and squeezing it in hot water.



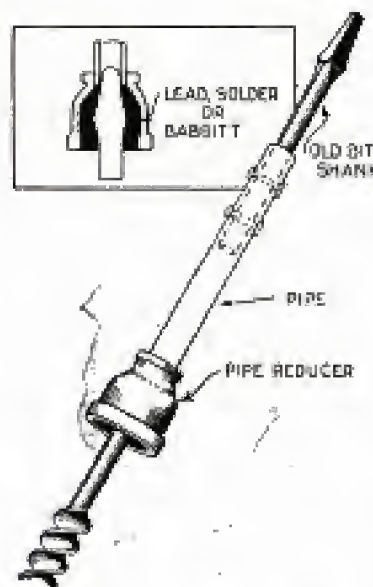
# Nested Tables Improve the Small Apartment



This set of three nested tables is a great convenience where space is limited. As the spindles are of uniform design and size, they can be turned easily on a lathe, while the curved pieces can be cut with a coping saw, if no scroll or bandsaw is available. The maximum finished diameter of the spindles is  $1\frac{1}{4}$  in., so they should be turned from rough pieces,  $1\frac{1}{2}$  in. square by about 24 in. long. The finished length is only 21 in., but allowance should be made for a dowel on each end, about 1 in. long and turned down to  $\frac{3}{4}$  or  $\frac{5}{8}$  in. The table tops are in 9, 10 and 11-in. widths, and should be made up of narrower sizes glued together and sandpapered smooth. The edge of each top can be molded on a shaper, or may be simply beveled with a plane. On tables Nos. 1 and 2, the curved underpieces in which the spindles are set, are similar in shape, except that No. 2 is shorter than No. 1, but the underpiece of table No. 3 is a mere cleat. The curved feet of all three tables are alike in design except that they are of different lengths. The underpieces are fastened to the table

tops from beneath with screws, the heads of which are countersunk. Glue, of course, is used on all joints.

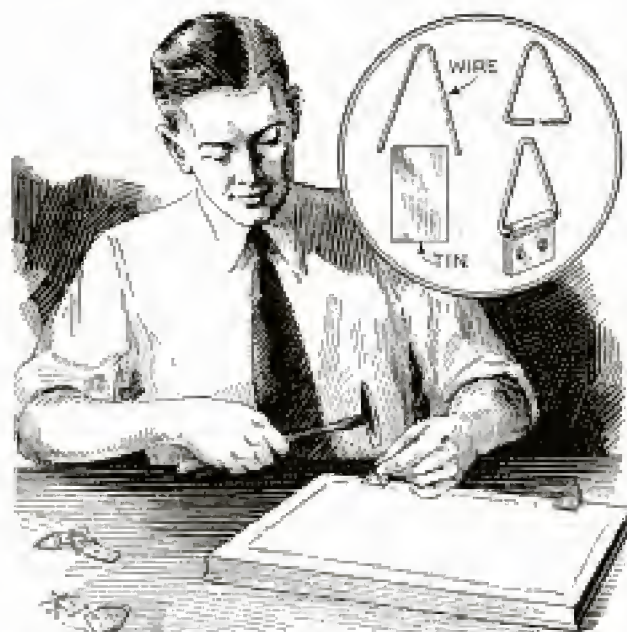
## Extension Drill Quickly Improvised from Pipe



If an extension drill is not available when needed, one can be quickly improvised from a length of pipe, a reducer and an old auger shank. Rivet the shank into one end of pipe and screw the reducer on the other end.

Then put the shank of the auger into the reducer and pour melted lead or babbitt around it, making sure that the shank is centered.





Strong Picture Hangers Can Be Made from Wire and Hinges of Tin

### Neat Picture Hangers Improvised from Wire and Tin

Attractive picture hangers can be made from short pieces of wire and tin. The wire is bent into a triangular shape and the tin is doubled over the ends of the wire as indicated.—Henry Rabacher, Mt. Vernon, N. Y.

### Moth Balls Warn When Furnace Water Pan Is Empty

Placed in a water pan on a furnace, a naphthaline moth ball will give warning when the pan is empty by filling the house with its odor. The naphthaline in the ball is not soluble in water, and for this reason no odor will be noticeable as long as the ball is covered with water.—Emil F. Lange, Lincoln, Nebr.

### Improving Latch Handle on Door of Truck



Truck drivers, who have trouble in gripping the handle on the door latch, will find that a rubber crutch tip on the handle provides a better hold.

The tip will not interfere with the operation of the glass in the door, and it is especially handy when heavy gloves are worn.

### Puncture-Proof Tires for Pushearts

To make solid pushecart and trailer tires for occasional use, get a wooden pole the same size as the inside diameter of the tire. Saw this into sections, about 3 in. in length, and place them end to end inside of the casing, which is then placed on the rim in the usual way. This improvised "tube" will be fairly smooth-running and will last the life of the tire.—A. B. Bates, Los Altos, Calif.

### Shelf Bracket Holds Wet Shoes over Hot-Air Register

A good holder for drying wet shoes above a hot-air register can be made from a shelf bracket and three pieces of 1 by 2-in. wood, joined at right angles as shown. In use, the base is set at one corner of the register, and the shoe is placed over the end of the bracket. Do not let the shoe get hot as this most likely will cause the leather to crack.



### Extra Hour Hand Eliminates Confusion of Daylight-Saving Time

A jeweler had a customer who was confused by daylight-saving and standard time, and solved the latter's difficulty by adding one hour hand to his watch. The hand in the advanced position was marked with a "D" for daylight-saving time, while the other was marked with an "S" for standard time.

☐ Holes can be drilled through almost any number of sheets of paper at one time if the paper is tightly clamped between two boards, and the drill run through both boards and paper.



# A New ROOF for your HOME

By SAM BROWN

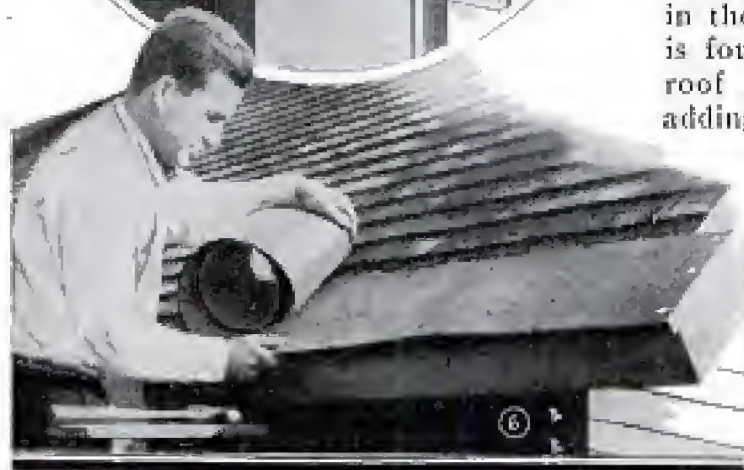
NOTHING adds so much to the attractiveness of the small home as a colorful roof. Moreover, the job of reroofing with modern asphalt shingles is easily within the capabilities of any home craftsman.

Getting started demands first an estimate of the quantity of roofing necessary. This can be



done by using the roof gauge shown in Fig. 3. With this in your hand, step off about 100 paces from the main gable,

making certain that your selected position is directly centered with the ridge and directly at right angles to the sidewall. Then, by sighting over the various angles of the gauge, you can readily determine the exact pitch of the roof. Say, it is  $\frac{1}{3}$  pitch. The pitch factor for this is 1.202, as shown in the same figure, and the roof surface is found by multiplying the area of the roof measured flat by the pitch factor, adding as many feet as you deem necessary for waste, duplications, hips and valleys. Here's an example: Your home is 30 by 30 ft. The area of the flat roof would be, then, 30 by 30, or 900 sq. ft. The roof is  $\frac{1}{3}$  pitch. So, 900 by 1.202 would give you 1,082 sq. ft. A dormer would make no difference except that you would add the roofing necessary to cover at the







will need  $11\frac{1}{2}$  "squares" of roofing, the square being a unit of 100 sq. ft. Pick a good grade of roofing. Cut-out roll roofing, as shown in Fig. 1, makes an inexpensive covering which is quite practical. Other types in strip, individual and patented shingles usually cost more, but give greater protection and are obtainable in a wider variety of patterns and colors.

First of all, the old wood shingles must be given the "once over." Warped slabs should be split with a hatchet and securely nailed to the lath, as in Fig. 4, using 12-gauge roofing nails. Gutter fastenings

eaves where the dormer roof would overlap the main roof, 1 sq. ft. of roofing being added for every running foot of hip or valley. Working in this manner, the most irregular roofs can be quickly and easily figured. The rule applies whether the house be four-gabled, three-gabled, gable, hip or dormer hip. Imagining your calculations run 1,150 sq. ft. of roof, you

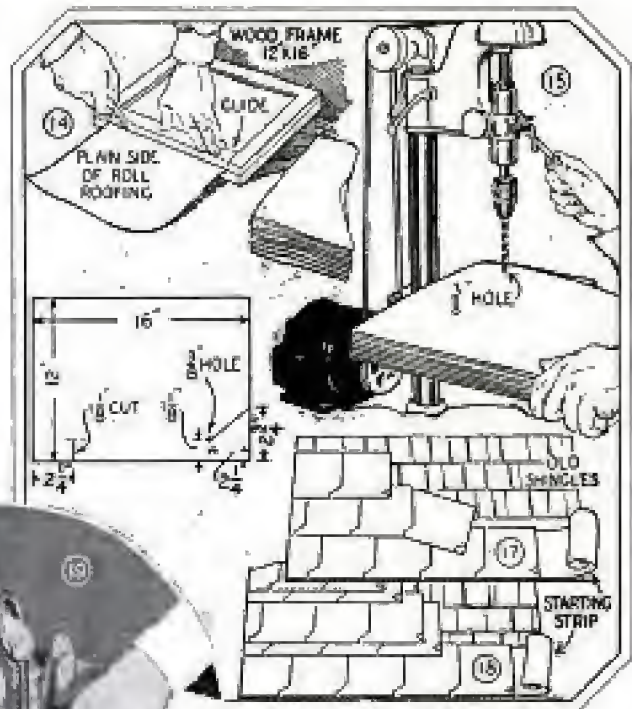


should be checked and repaired if necessary. Loose brickwork should be pointed up. The roofing job proper commences with the fitting of the metal edge strips, as shown in Fig. 5. These measure about 3 by 1 in. and are of light galvanized sheet iron. Their purpose is to give a finished edge over the old wood shingles. They are not absolutely necessary, but are invariably used in better-class work. Over the metal edge strip, and projecting just a bit beyond the eaves, is fitted the starting strip, as shown in Fig. 6. This is usually roll roofing, regardless of what the finishing shingle is like, and it should be of a



width equal to the depth of the shingles selected. No. 12-gauge  $1\frac{1}{2}$ -in. galvanized roofing nails should be used for fastenings. These can be inserted anywhere, as the combined thickness of the old shingle roof and the new covering will never be less than  $\frac{3}{4}$  inch.

If you are using cut-out roll roofing as a finish, the job proceeds as shown in Fig. 7, the first strip being placed directly over the starting strip, with each succeeding strip laid so as to expose the proper part of the strip immediately under it. Instructions on this are usually stamped on each

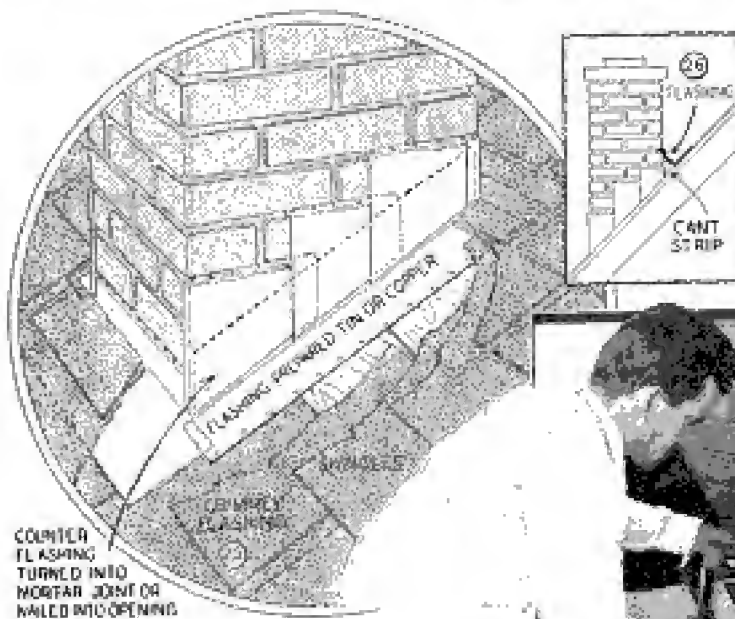


straightedge, as shown in Fig. 10, allowing about 3 in. on either side of the joint. Fig. 12 gives the necessary details of a simple roof jack which you will find quite necessary before you are finished. This is used as shown in Fig. 13, one jack being attached at each end of any suitable length of 2 by 4-in. stock. Each jack is held by a nail, which is hammered down when the jack is moved.

roll. Working up to the final strip on, say, a porch roof, fit the free end of the strip neatly under the siding, as shown in Fig. 8. Plastic roof cement may be used, but it is not necessary. Ridges and hips should be finished with individual strips measuring about 8 by 12 in., as shown in Fig. 9, although one continuous strip can be used where expense is an item. If there is a valley in any part of the roof surface, this should be covered first. Use a continuous strip, not less than 16 in. wide, fitting this in place as shown in Fig. 11. The roofing—roll or shingle—is brought to a rough fit at the valley and later trimmed with a



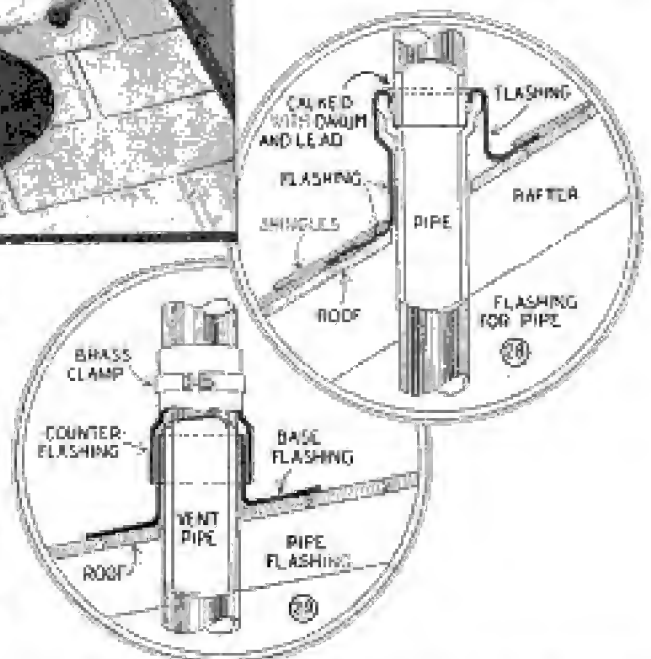




Would you like to make your own asphalt shingles? Figs. 14 to 19 inclusive show how this can be done. Take roll roofing, 32 in. wide, and split it down the center to obtain two strips 16 in. wide. Each strip is readily cut into large individual shingles by using the simple box frame shown. You will find that knives and tin snips do better on this job if dipped occasionally in kerosene. If you care to go a step farther, you can make a lock-type of shingle, as indicated in Figs. 15 and 19. Fig. 17 gives one method of laying a shingle of this type, the exposure being 10 in. to the weather. Notice how the one fault of roll roofing—exposed nailing—is eliminated by covering each nail head with the locking flap. Double coverage can be obtained by laying the shingles 5 in. to the weather in this fashion or by using the ribbon course of 10 and 3-in. exposures shown in Fig. 18. A simple lock shingle like this can be laid in many different ways. Used without the lock, these large shingles can be laid up either vertically or horizontally with a 5-in. exposure and  $\frac{3}{4}$ -in. channels, as shown in Fig. 20. Notice, in Figs. 21 and 22, how each succeeding course is stepped up and nailed to form a watertight joint against brickwork and abutting siding.

A little jig which comes in handy in laying many types of shingling is shown in Fig. 23. With the metal straps hooked over the previous course, you can't go wrong in allowing the exact amount of exposure, and at the same time you keep

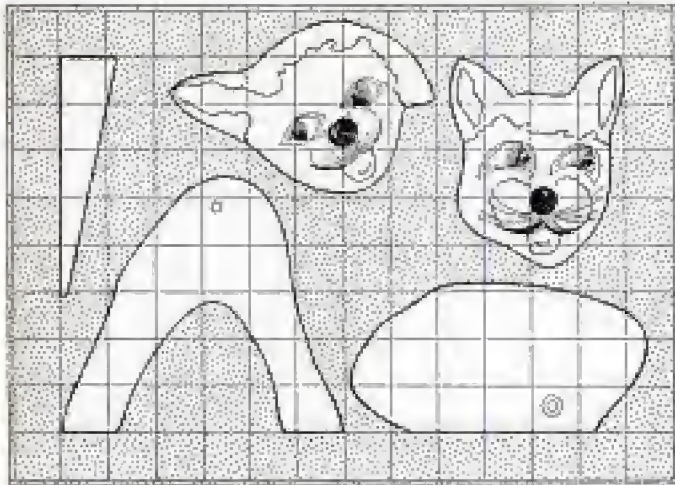
each course perfectly straight from end to end. Another useful bit of roofing equipment is shown in Fig. 24: a triangular support of wood held to the roof by two nails projecting slightly from the underside of the base piece. If your choice of roofing material runs to rigid asbestos or composition shingles, it will be necessary to flash all joints with metal instead of following the simpler method possible with asphalt roofing. The necessary details on this work are shown in Figs. 25 to 29. The procedure is much the same as pre-



viously described with the exception that flashing tin or 16-oz. copper is used. Chimneys should be flashed and counterflashed for best results, as in Fig. 25, with the counterflashing either turned into the mortar seam or nailed well inside the joint. A cant strip of wood stock is sometimes fitted at the upper side of the chimney, as in Fig. 26, in order to break what would be otherwise an exceedingly sharp angle. On abutting sidewalls, metal flashing is laid up with every course of shingles, as in Fig. 27, fastening the metal securely to the siding. Vent pipes can be treated as in Figs. 28 and 29, the latter showing the usual procedure in treating a pipe which projects without break above the roof.



# Wooden Puppy Makes Effective Doorstop



Interesting doorstops, made from four pieces of wood to represent puppies and kittens, can be built up in a short time and, incidentally, are excellent novelties, the profits of which will repay you well for the time spent in making them. The upper detail shows the shapes to which these pieces are cut from 1-in. stock. Screws are used to assemble the pieces, the head being held by one



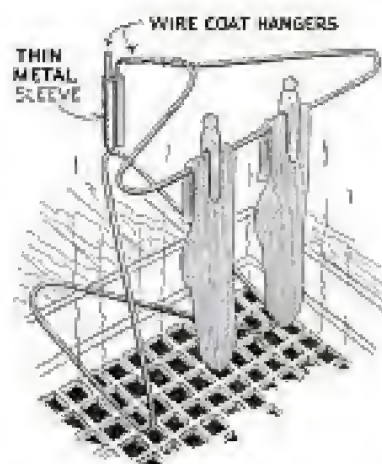
screw so that it can be tilted at any desired degree. The tail is a narrow wedge which fits under the door and holds it. This piece is glued and screwed to the body so that it will not be likely to come apart. After sandpapering the edges and surfaces smooth, a coat of shellac is applied to fill the wood, after which the head and feet are painted on as shown. Almost any scrap lumber can be used for making these stops, and the work can be done with a hand or a power-driven scroll-saw.--Henry Kramer, Chicago.

## Glass Containers Hold Small Parts

Instead of keeping nails, screws and small parts in metal or wooden boxes, put them in small glass jars fitted with tight covers. If they are set on a shelf, a glance will tell you where to find the article you want, and what things you are running short of. The tight-fitting covers prevent moisture from entering the jar and keep the articles from rusting.

## Wire Rack for Drying Hose over Hot-Air Register

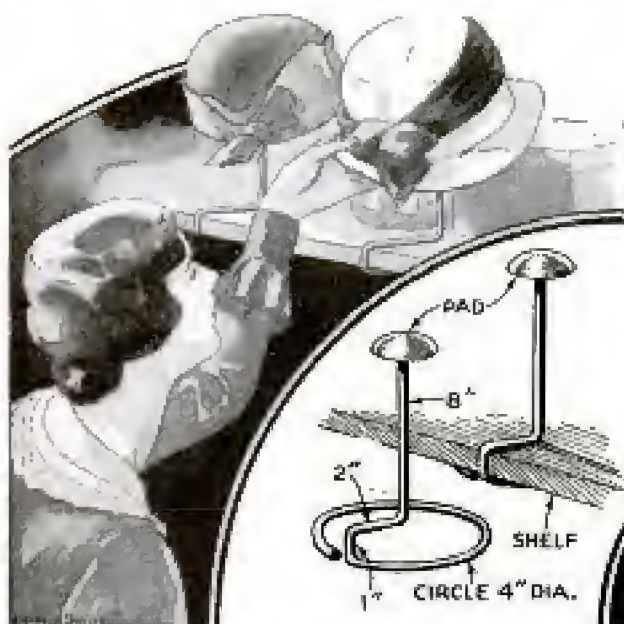
By using two wire clothes hangers, you can make a handy rack for drying hose



base. When not in use, the rack is easily dismantled and stored.

over a hot-air register. One hanger is bent to form a base, while the hook on the other is straightened out and bent at right angles to fit in a metal sleeve slipped over the twisted ends of the





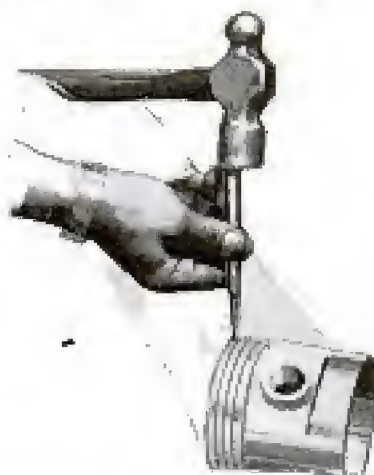
Wire Rack Clamps over Closet Shelf and Keeps Hat from Being Crushed

### Wire Hat Rack Clips on Shelf

When slipped over the edge of a closet shelf, this wire rack provides a place to hang your hat so that it will keep its shape and not be crushed by other clothes. One end of a length of heavy wire, such as can be obtained from wire clothes hangers, is formed into a 4-in. loop and then bent to fit snugly over the edge of a shelf as shown in the detail. A disk of wood can be shaped to form the pad at the top of the rack.

### Making Piston Rings Last Longer

When the rings on an aluminum-alloy piston get loose, they can be made to fit snugly again by swelling the metal between the grooves with a hammer and punch as shown. The rings are removed and the piston is placed on its side on a wood-topped bench, after



which the punch is set in the center of the space between the grooves and tapped with a hammer. Care should be taken not

to get the punch too close to the edge. After the width of the grooves has been reduced uniformly, take one ring at a time and roll it around the groove to see if it fits snugly. If it wedges, dress off the sides of the groove with a flat file until the ring turns without noticeable sideplay. When a job of this kind is done, it is best to use light expanders behind the rings to prevent piston slap. While this suggestion is not offered as a substitute for re-boring and fitting new pistons, it has been known to give thousands of miles of satisfactory performance at small cost.

### Sign in Radiator Warns Attendant of Anti-Freeze Solution

In order to prevent filling-station attendants from adding water to the anti-freeze solution in my radiator, I put a warning sign directly under the cap. The lettering is stamped on a brass disk, which is held in place with a piece of wire, one end being soldered to the disk and the other bent so that it fits into the top of the overflow pipe. The lettering should be filled with a good heat-resisting enamel.—W. C. Wilhite, Hornsby, Ill.



### An Inexpensive Poultry Disinfectant

The experimental farm of the Canadian government has developed an effective disinfectant for poultry house and equipment that can be made at a small cost. Dissolve concentrated lye,  $\frac{3}{4}$  lb., in as small a quantity of water as possible, and then slowly add raw linseed oil,  $\frac{1}{2}$  qt., stirring until the mixture is the consistency of liquid soap. To this, add a gallon of commercial creosol, stirring until the fluid takes a clear, dark-brown color. This mixture should be made up several hours before it is used, so that the lye will have time to cool. For a spraying solution, use a half cupful of the disinfectant to each gallon of water.



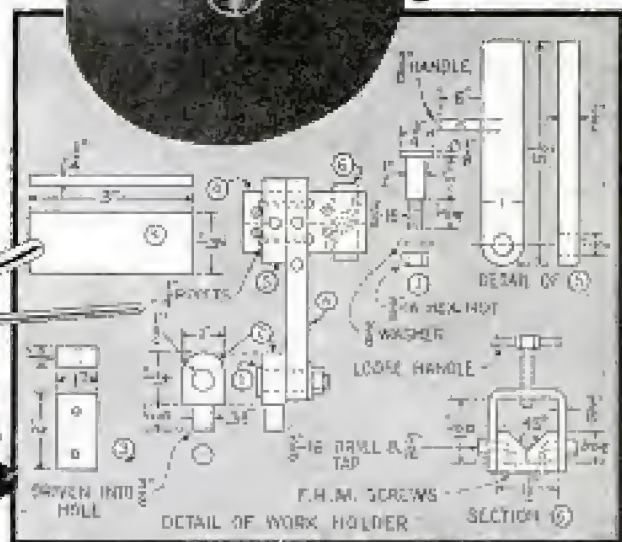
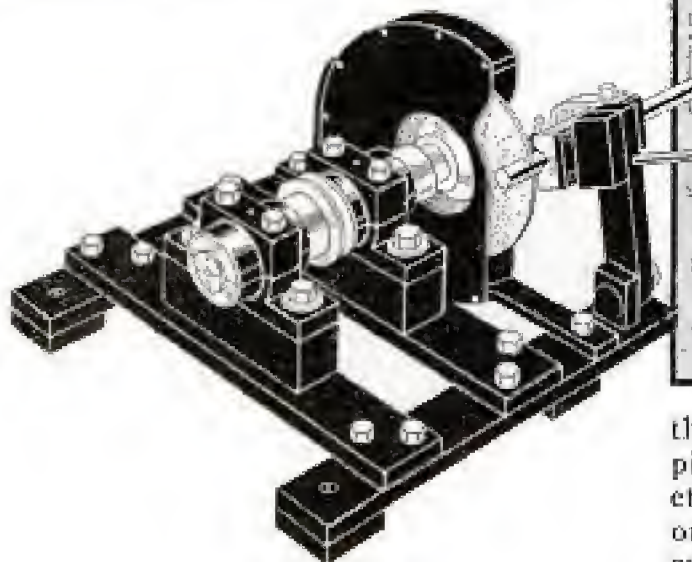


# High-Speed CUT-OFF WHEEL Saws Metal Quickly

By Randolph E. Craig

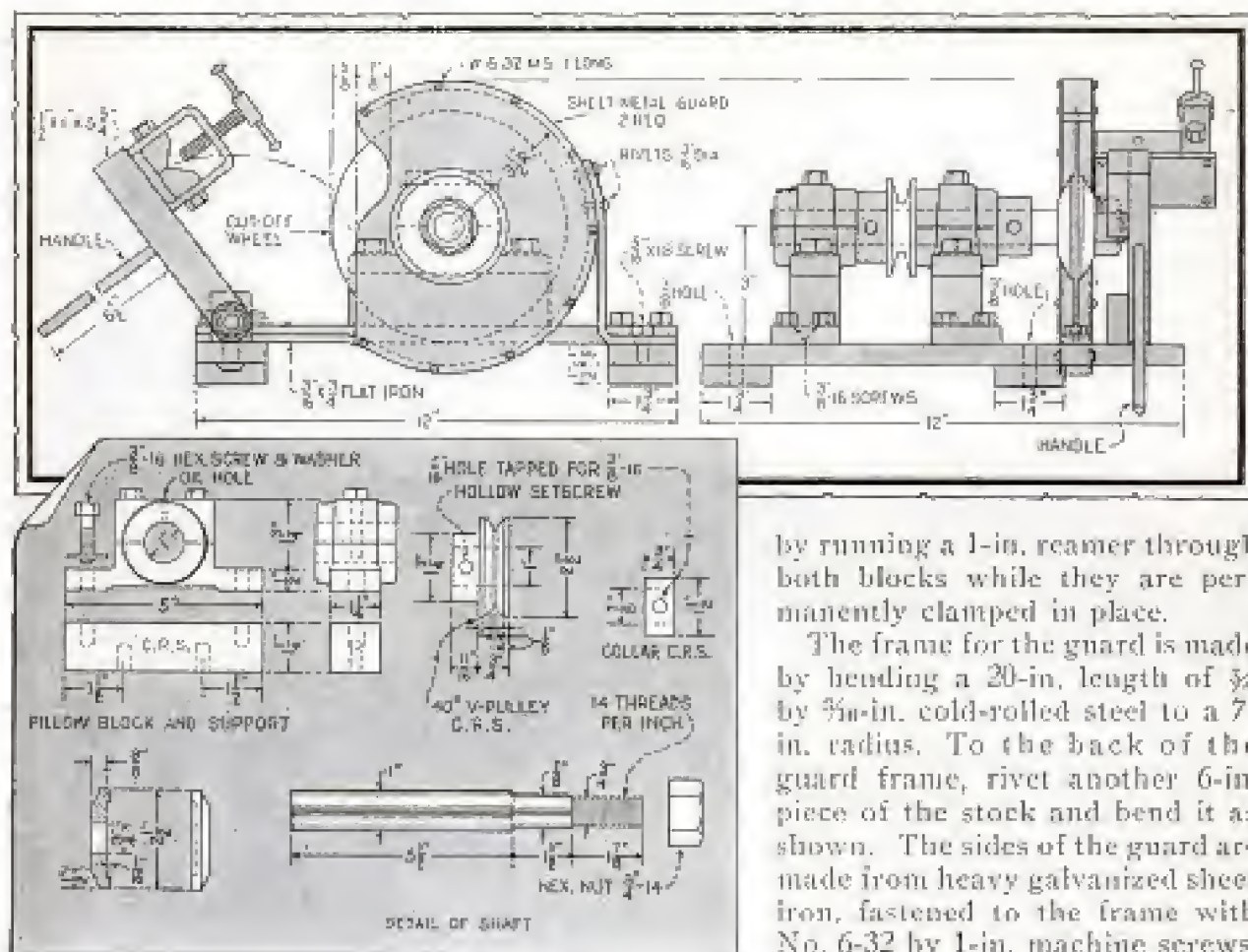
WITH this new type of inexpensive high-speed abrasive cut-off machine, it takes only a few seconds to do many jobs which by old methods would require from five minutes to half an hour. You can quickly cut either round or irregular-shaped pieces of steel, brass, bakelite or fiber, or even the hardest tool steel, to exact dimensions and so smooth that filing is unnecessary. Washers and disks may be made quickly and accurately by simply sawing off lengths of either metal or bakelite rod or tubing. The machine will cut slots or grooves much faster and better than can be done with a hacksaw.

The shaft is made first, from a piece of  $1\frac{1}{8}$ -in. cold-rolled steel,  $8\frac{3}{4}$  in. long. The threads on its end should be cut on the lathe to insure an accurate fit. To turn



the pulley, drill a 1-in. hole centrally in a piece of cold-rolled steel,  $2\frac{3}{4}$  in. in diameter and  $1\frac{1}{4}$  in. wide. This piece is driven onto a tapered arbor and turned to the dimensions shown. A setscrew, preferably





of the hollow type, is used to hold the pulley in place on the shaft, and a collar is necessary to prevent end play. The flanges may be purchased at small cost or can be turned to size. The pillow blocks are either made or purchased. They are mounted on pieces of  $1\frac{1}{4}$  by  $1\frac{1}{4}$  by 5-in. cold-rolled steel to raise them to the correct height. The base is constructed from  $1\frac{3}{4}$  by 1-in. cold-rolled steel. To assure perfect alignment of the pillow blocks, install the shaft with its pulley and collar and set the unit in place on the base. The blocks are clamped to the base and the shaft tested for alignment. With the assembly clamped in position, carefully mark the blocks where the screw holes are to be drilled. Draw up the screws and adjust the blocks so that the shaft turns as freely as possible. Next, drill holes through the cross and the pillow-block supports, the latter holes being tapped. The unit now can be permanently assembled. It may be necessary to place a thin sheet of paper under the edge of one or both of the pillow blocks to allow the shaft to turn freely. If the shaft fits too tightly, it can be freed

by running a 1-in. reamer through both blocks while they are permanently clamped in place.

The frame for the guard is made by bending a 20-in. length of  $\frac{3}{4}$  by  $\frac{3}{16}$ -in. cold-rolled steel to a 7-in. radius. To the back of the guard frame, rivet another 6-in. piece of the stock and bend it as shown. The sides of the guard are made from heavy galvanized sheet iron, fastened to the frame with No. 6-32 by 1-in. machine screws.

The front edge of the guard is shaped so that it serves as a stop for the movable work holder. The latter, in which the work is clamped, must be rigid and absolutely free from play.

When the machine has been completely assembled, it should be driven with a motor at low speed and with plenty of oil until the bearings are well limbered up. The cutting disk is a 6-in. diameter,  $\frac{1}{16}$ -in. thick bakelite-bonded cut-off wheel. When purchasing wheels, be sure to specify a  $\frac{1}{4}$ -in. hole. In order to drive the wheel at the proper speed, the motor will have to be fitted with a large pulley. If your motor runs at 1,750 r.p.m., place an 8-in. V-pulley on its shaft and belt this to the cut-off machine. With a 3,500-r.p.m. motor, use a 4-in. pulley. This will drive the machine at approximately 6,370 r.p.m., which is satisfactory for this size of wheel. A  $\frac{1}{4}$ -hp. motor will cut iron and steel rod up to  $\frac{1}{2}$  in. in diameter quite readily, and will rapidly cut up to  $\frac{3}{4}$ -in. brass. A  $\frac{1}{3}$  or a  $\frac{1}{2}$ -hp. motor, coupled to the machine with a heavy V-belt, will enable you to cut 1-in. stock. When using the machine, clamp the work rigidly in place and stand at one

Norton Co. Worcester, Mass.  
Carborundum Co. Niagara Falls, N.Y.



side while cutting. Wheels are likely to break after considerable use. The parts will fly straight out from the opening, however, and, with ordinary precautions, there is no danger.

### Hacksaw Blades Serve as Substitute for Rasps and Files

A good substitute for a file or rasp can be made by fastening together a number of hacksaw blades of the same size, slipping a bolt through the hole at each end. By using blades with different sizes of teeth the coarseness or fineness can be varied. If the direction of the teeth is alternated when putting the blades together, the file will cut when pulled in either direction.

### Self-Locking Socket to Keep Electric Lamps Tight

Electric lamps that have a tendency to work loose in their sockets can be kept tight as follows: Remove the outer shell of the socket, and, with a pair of tin snips, make a V-shaped cut,  $\frac{1}{8}$  in. wide and  $\frac{1}{2}$  in. long, in the threaded part of the socket;



then bend in the shell on one side of the cut as shown. The bent edge bears against the metal part of the lamp and prevents it from loosening. This method will be found especially handy on machinery or in shops.

### Making Worn Reamer Cut to Size

When a tap or reamer becomes slightly worn and cuts undersize, fill the grooves or flutes with yarn, cotton string or candle wicking. The material should first be moistened with water so it will pack in the grooves and stay in place. The tool can be made to cut oversize in the same manner.



Calking Compound Forced into Cracks around Door with Gun Improvised from Paper Cone

### Gun for Applying Calking Compound

For applying calking compound around door and window casings, a pressure gun may be quickly improvised by fashioning a cone from heavy manila wrapping paper. After filling the cone, it is squeezed to force the compound out the small end and into the cracks around the casing.—R. H. Townsley, Chicago.

### Chamois Bag on Hose Nozzle Filters Gasoline at Station

Attached to the nozzle of a gasoline hose, a chamois bag will filter gasoline so that it is free of water and sediment when it enters the tank. Filling-station operators will find this precaution appreciated by their customers, especially in cold weather when water in the gasoline may freeze and cause trouble.—H. C. Thomas, Royal Oak, Michigan.





# GOLD WASHERS



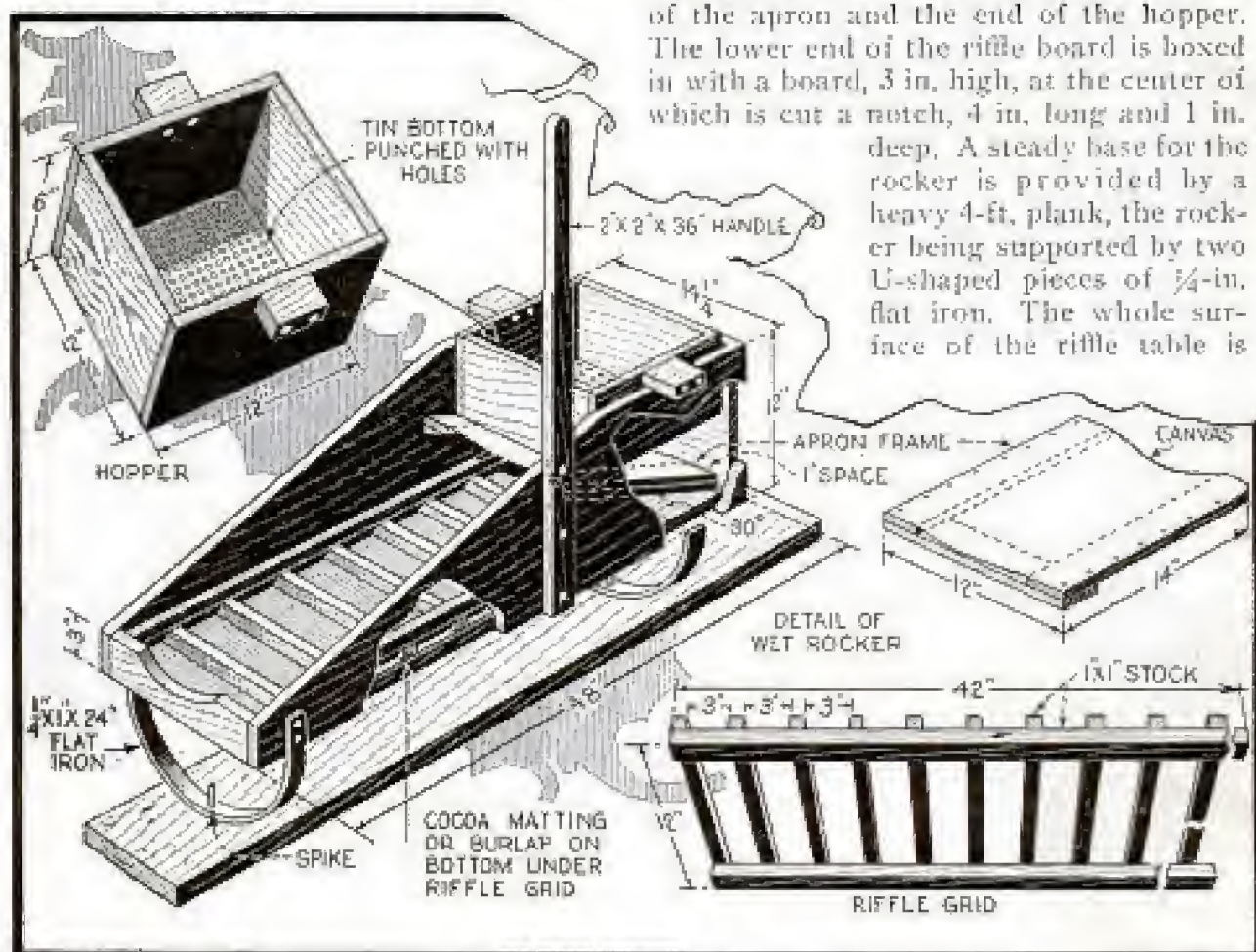
**M**ILLIONS of dollars worth of gold dust and nuggets are recovered annually from river sands and dry washes by prospectors who have little equipment

besides the gold pan. One man with a pan can sift through  $\frac{1}{2}$  cu. yd. of material a day, but by building a simple gold-washing machine, he may increase his production four or five times.

There are two types of washers. One is a wet rocker, used when water is available, and the other is a dry washer, where water supply is lacking. In both machines, the dirt is cascaded down an inclined plane. The gold, being heavy, sifts to the bottom and is caught behind riffles, while the lighter matter passes over the riffles and falls out.

The wet rocker consists of a riffle board with sides and a back built up to support a hopper, which has a tin bottom perforated with  $\frac{1}{4}$ -in. holes spaced 1 in. apart. A canvas apron is tacked to a frame laid on the cleats, which are set at a  $30^\circ$  angle. A 1-in. slot is left between the lower end of the apron and the end of the hopper. The lower end of the riffle board is boxed in with a board, 3 in. high, at the center of which is cut a notch, 4 in. long and 1 in.

deep. A steady base for the rocker is provided by a heavy 4-ft. plank, the rocker being supported by two U-shaped pieces of  $\frac{1}{4}$ -in. flat iron. The whole surface of the riffle table is





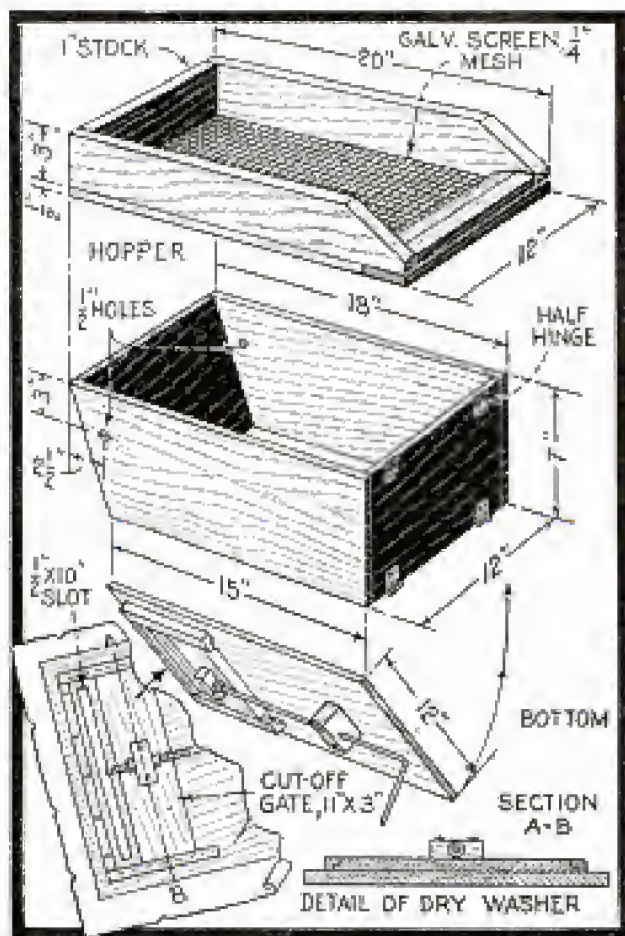
10555 Holman Ave  
Los Angeles Calif

# increase Prospectors' Earnings

By  
THOMAS E STIMSON

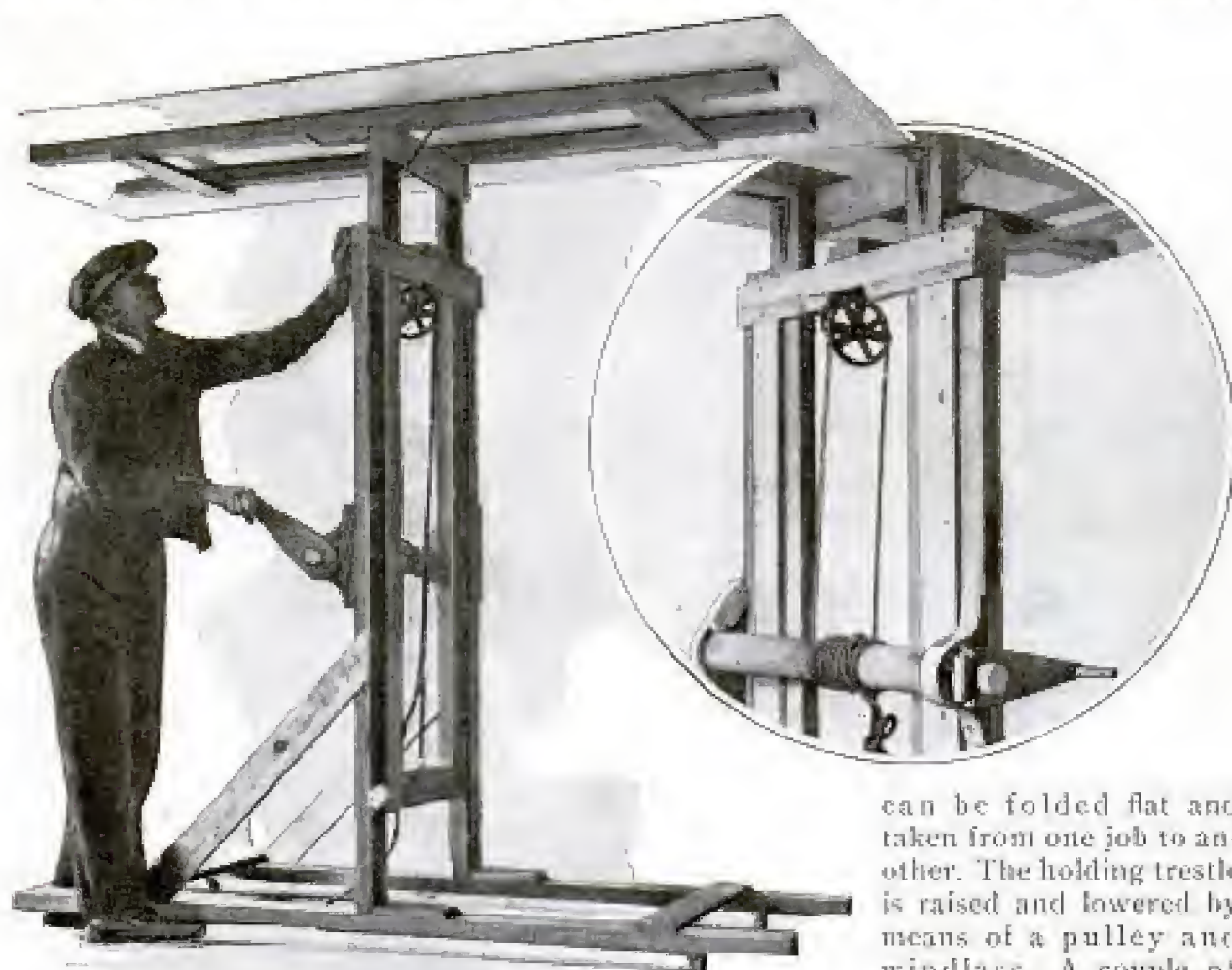
covered with a sheet of cocoa matting, canvas or a blanket, on top of which there are a number of cross riffles. The riffle grid is removable. In use, the hopper end of the plank is propped up about 2 in. with rocks, to slant the riffle board. The hopper is then half filled with the gold-bearing material and water is poured on. When all the fine material has passed through the holes in the bottom of the hopper, the latter is lifted out and the large gravel and stones are emptied. To make a "clean-up," the riffle bars are removed and the cocoa matting or canvas is carefully lifted out and washed in a tub of water. The gold and other particles that have been caught on the cloth fall to the bottom of the tub, and this concentrate is further reduced by panning. The wet rocker must be adjusted for each kind of material to insure full

(Continued to page 118A)





## Erector Places Wallboard Against the Ceiling



Raising and holding heavy wallboard in place on a ceiling while nailing it, is an easy task with this scaffolding which was made and used by C. R. Lane, of Guilford, Conn. It is set on casters so that it can be run around a room in any position, and

can be folded flat and taken from one job to another. The holding trestle is raised and lowered by means of a pulley and windlass. A couple of turns is enough to lower it to the loading position at the height of a man's head. The platform is then raised to the ceiling where it holds the board while the carriage is moved easily on its casters until the board is placed in position for nailing.—H. Rositer Snyder, Guilford, Conn.

### An All-Purpose Carrying Handle Made from Leather and Strap Iron

For carrying objects, such as batteries, heavy cases and metal parts, or for lifting cylinder heads, a good handle can be made by riveting pieces of strap iron to the ends of a



leather strap. A large hole is drilled in each piece of the iron, which also has a hook bent on the end. In this way, the handle can be anchored under bolts or hooked under projecting parts.—Ted Berg, Chicago.

### Rivets Improvised from Copper Wire

For emergency use, rivets can be made from short pieces of copper wire by hammering a head on each end. If plain wire is not available, wire used in electrical work can be substituted by removing the insulation.



### Nickelplating without Electricity

A thin but durable nickelplate can be put on brass and copper objects by boiling them in a solution made by dissolving ammonium chloride,  $8\frac{1}{2}$  oz., and nickel-ammonium sulphate,  $8\frac{1}{2}$  oz., in 1 qt. of water. The solution should be boiled in an aluminum pan. An even plate will be produced if the articles are kept in motion, but in contact with the pan during the plating process. Brass or copper is readily cleaned for plating by washing it in gasoline, to remove the grease, and then immersing it in a bright dip made by mixing nitric acid, 1 lb., with an equal volume of water. To this cautiously add sulphuric acid, 2 oz., and two teaspoonfuls of ordinary table salt. This acid solution should be kept in a stone jar. After dipping the work, rinse it in running water, and it is ready for the nickelplate. This process is convenient and effective for small articles. If 2 oz. of strong ammonia are added to the plating solution, it will plate articles of iron and steel.

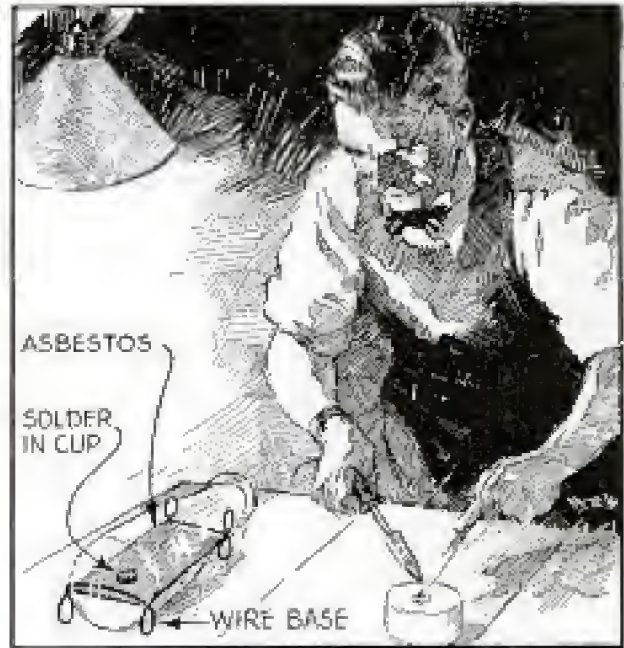
### Extra Handle Improves Coal Shovel



Fastened to the handle of a coal shovel as indicated, an extra handle will be found restful to the hands and wrists, besides making it easier to lift the scoop. A bolt inserted into a hole drilled through the shank holds it in place.

### Locating Leaks in Electric Refrigerators

Leaks in electric refrigerators, that use ammonia gas, can be located with sulphur. Roll powdered sulphur in a piece of paper similar to a cigaret, light it and pass it around under the valves and fittings. Sulphur fumes, uniting with ammonia fumes, produce a dense white cloud similar to smoke. If the refrigerant is sulphur-dioxide gas, the same result will be obtained by passing an uncorked bottle of common household ammonia around the fittings.—B. E. Wilder, Chicago.



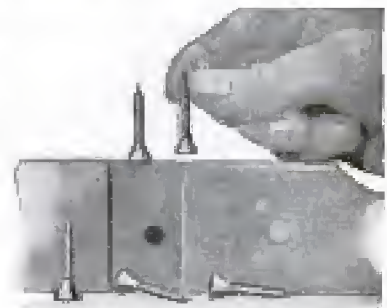
Heat Quickly Restored to Soldering Iron in Constant Use by Keeping It in Milk Bottle

### Bottle Prevents Rapid Cooling of Soldering Iron

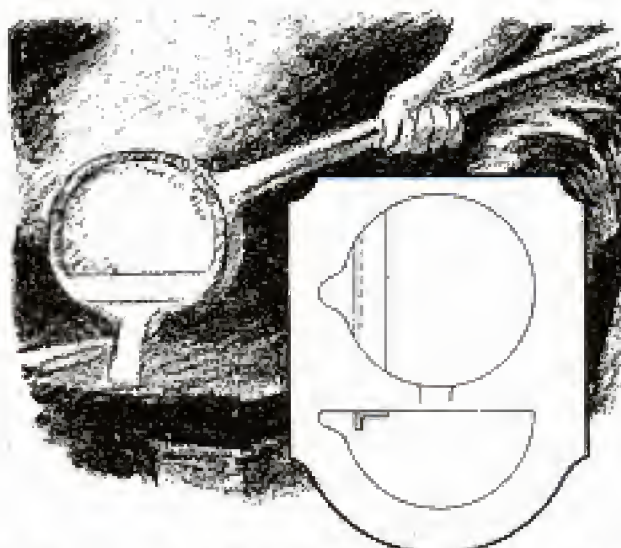
When a soldering iron is in constant use, the heat lost by contact with the work can be quickly restored if the iron is placed in a container. A quart milk bottle, with a piece of asbestos slipped inside, is suitable for this purpose. A wire rack can be improvised to hold the bottle, while the sheet of asbestos prevents the hot iron from coming in contact with the glass. A shallow cup of solder inside is handy for determining whether the iron is hot enough for use.

### Golf Tees Plug Screw Holes

Wooden golf tees will be found useful for plugging old screw holes. The tapering heads of the tees fit snugly into the enlarged hole made by the screw head, while the shank fills the remainder. It is a good idea to grind the head of the tee flat so that it will not be chipped while it is being tapped down with a hammer.







Strip of Sheet Metal across Top of Babbitt Ladle Retains Scum When Pouring

### Sheet-Metal Scum Guard Improves the Babbitt Ladle

Placed across the top of a babbitt ladle near the spout, a sheet-metal bridge will prevent the scum from coming out when pouring the babbitt. The edge of the guard is bent over at right angles, as indicated, to increase its effectiveness.

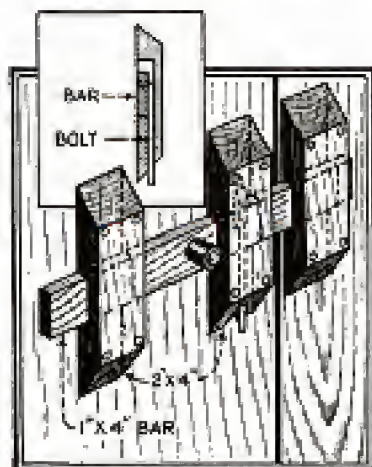
### Remote-Control Switch to Operate Elevator Car

In order to operate an elevator from the top of the car for the purpose of cleaning the shaft, the electrician of a large hotel made a control device that is held in one hand. The instrument is fool-proof in that it is necessary for the operator to be fully conscious of what he is doing in order to

work it. The device consists of a push-button switch, a four-prong polarity cap, and a four-prong polarity receptacle. Two sets of wires connect the switch with the control switch in the elevator. In this way, anyone holding the push button in his hand, when it is connected with the car switch, can control the elevator cage when standing on top. This saves time as it ordinarily requires two men to clean the elevator shaft.—Ed Deuss, Chicago.

### Safety Latch for Stock Gates

By the addition of a bolt to the sliding latch commonly used on farm gates, it can be locked so that stock rubbing against the handle cannot open it. A groove is cut in one of the vertical cleats, which carry the sliding bar, to take a rod. The latter is bent at right angles at one end and made to drop into a slot cut in the top of the bar when the latch is closed. The lower end of the rod projects beyond the bottom of the cleat so that it can be raised to clear the slot when the bar is pushed back.—B. P. Baresch, Rapid City, S. Dak.



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# Tools and Fittings for the

## MODEL MAKER'S LATHE

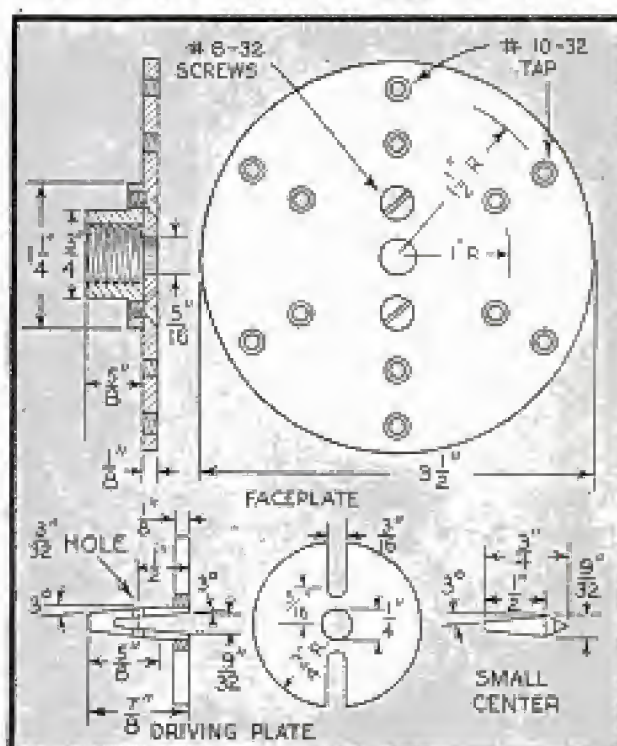
By W. R. BELL

### PART II

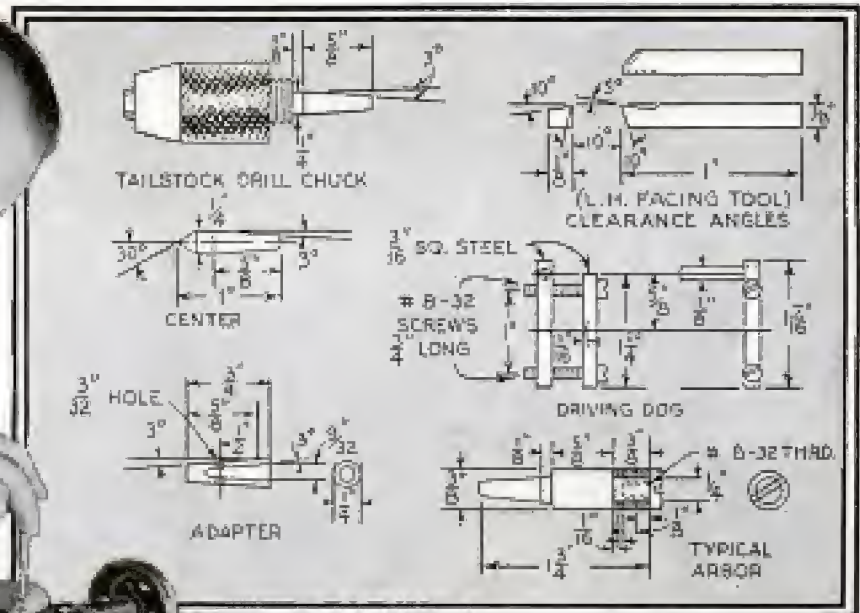
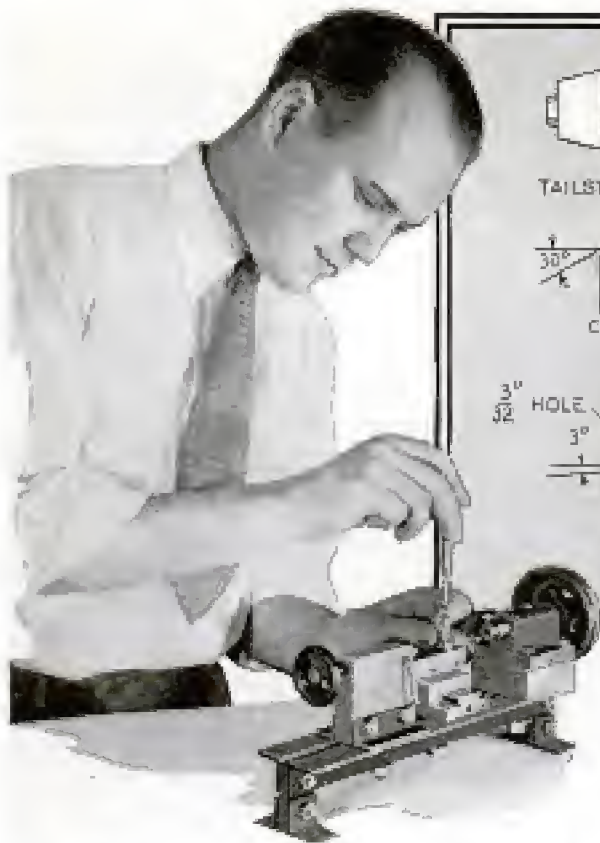
AFTER building the small model maker's lathe described in the November issue, you will need tools and equipment. The first essential is the cutting bit. For a general-use tool, it is best to have a clearance angle of  $10^\circ$ , a back slope of  $5^\circ$  and side slope of  $10^\circ$ . Experience will teach just how much to vary these for different kinds of work. Material for these bits can be purchased in the form of high-speed steel bars, already hardened and ready to grind, from supply houses handling jewelers' equipment. The rough bit for the lathe described should be  $\frac{1}{4}$  in. square and about 1 in. long. Of course, boring tools will have to be longer to suit each case.

Next in importance, from the standpoint of frequent use, is a small drill chuck for the tailstock. This will be used whenever holes are drilled in a piece held in the headstock chuck. Any-type chuck of  $\frac{1}{4}$ -in. capacity will suffice. Only enough of the inside threaded shaft is required to cover the full range of chuck adjustments, and a small taper shank is turned up and pressed into a hole drilled in the chuck. The taper must fit the hole in the spindle.

The faceplate is another part used frequently. This is best made in two pieces. The hub can be made from a nut, or from a similar piece, a hole being threaded to fit the shaft. The plate is laid out for the holes, and these are drilled and tapped before being mounted on the hub. Although the illustration shows the use of screws in







The driving plate and dog are used when small diameters are turned between centers. It is well to have more than one size, to suit your own conditions. The smaller size fits in the tapered hole, while the larger is screwed on like the faceplate. Arbors are used in innumerable ways, and for this reason it is advisable to have quite a range of sizes. They make good mountings for saws, small emery wheels and cutters, and may be used to hold small pieces

for turning when these have a concentric hole in them. Collars or spacers are included with each arbor to accommodate varying thicknesses to be held on them. Light milling or slotting can be done with the saws and cutters by clamping the work to the slide-rest top, with the toolpost removed; a few tapered holes in the rest top will aid in clamping. The tailstock makes a fine drillpress if provided with a plate having a taper shank. Make the plate of brass and solder the shank in. Face it true, and you will have a good surface to drill against. You are now equipped to do all kinds of ordinary metal-turning jobs of small size, and in special cases extra accessories can be made to suit.

### Old Tires Fence Garage Runway

A garageman having several old tires on hand, used them to make a fence from

the highway to his shop. The tires are partly buried in the ground and are painted white so as to be readily visible.—W. E. Stewart, Sewaren, N. J.



Garageman Utilized Old Tires to Make Novel Fence along the Drive from Highway to His Shop

### Grease Cup Dispenses Soap Paste

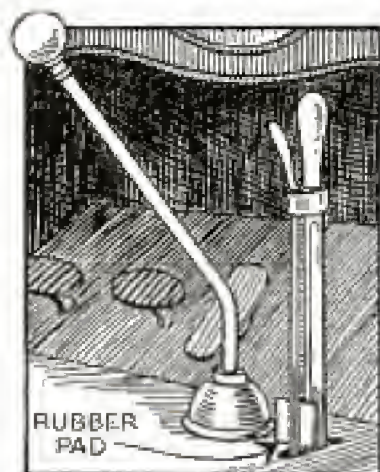
In shops and garages where hand soap paste is used by the mechanics, a large compression grease cup will be found handy for dispensing it. The cup is conveniently attached to the wall by means of a bracket. This method not only saves soap, but keeps the supply cleaner than it would be if it were taken out of the can with the hands.



### How to Produce a Steel-Gray Plate on Brass

Brass may be given a steel-gray plating with a thin coat of metallic arsenic. High lights are produced by buffing or scratch brushing. The solution for arsenic plating is made by dissolving finely powdered arsenic trioxide, 2 oz., (deadly poison) in hydrochloric acid, 1½ oz. A few drops of nitric acid and gentle heat will aid the solution of the arsenic. Make up this solution in the open air so that any fumes liberated will be blown away. When the arsenic has dissolved, add enough water to make the total volume 1 qt. This solution is very poisonous and should be used with great care. Thoroughly clean the brass to be plated by immersing it in a boiling hot solution of lye and water. Rinse the work thoroughly and immerse it in the arsenic solution. The steel-gray plate will form in a few minutes. After plating, the work should be rinsed in running water to remove the poisonous fluid.

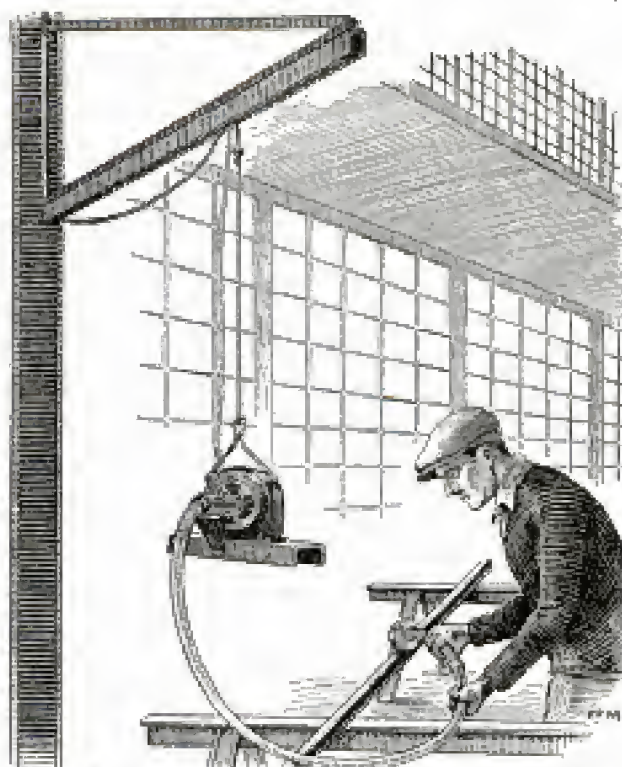
### Silencing Brake-Lever Rattle with Rubber Pad



Rattling of an emergency-brake lever, when caused by the small rod that operates the ratchet, can be overcome by folding a piece of inner tube and placing it between the two parts of the lever in the position shown. While this method is only temporary, as the rubber will gradually work out, it can be made permanent by fastening the pad to the lever with fine wire.—Joseph J. Zarnowski, Olyphant, Pa.

### Swinging Arm Supports Utility Motor

This handy jib support, for a motor equipped with a flexible shaft, can be swung around to accommodate jobs within a radius of 20 ft. The supporting arm, which is a length of track used for sliding

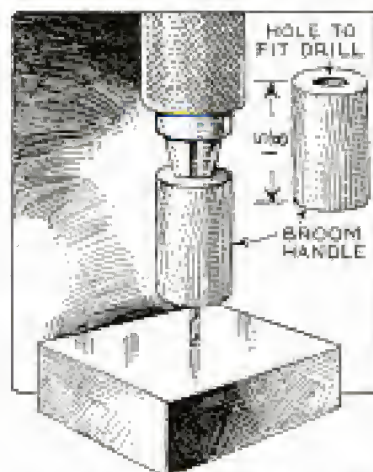


Arm Pivoted to Steel Column of Shop Provides Swinging Support for Utility Motor

doors, is welded to the underside of a similar piece of T-beam, and is braced with a length of bar stock. A rod through a pipe, which is welded to a steel column of the shop, provides a pivot for the arm.

### Wooden Sleeve Strengthens Small Drill Bits

When drilling small holes in metal, a wooden sleeve placed over the bit as shown, will keep it from bending and breaking under pressure. The sleeve is made by boring a piece of broomstick or dowel rod lengthwise, so that it fits snugly on the bit. This contrivance can also be used as a depth gauge, the sleeve being made just long enough to let the bit drill the desired depth.



Gasoline applied to the rubber washer on an inner-tube valve will usually soften it enough to stop a leak in the valve.



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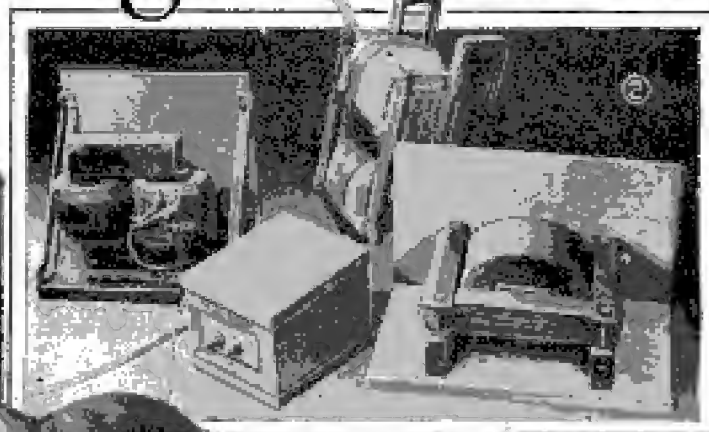
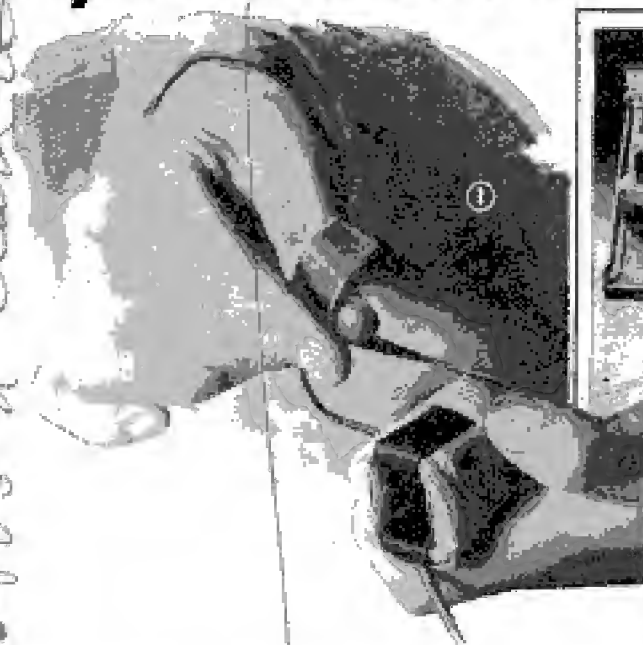


TABLE NO. 5

Size in Watts	Design No. For Use in Figuring Transformers of Sizes Not Listed in Tables 1, 2, 3 and 4	Fuses for Line		Wire Size for Primary Coil			
				Shell Type		Core Type	
		110 Volts	220 Volts	110 Volts	220 Volts	110 Volts	220 Volts
5	2.24	1	1	34	36	32	35
10	3.16	1	1	31	34	30	33
15	3.87	1	1	29	32	28	31
20	4.47	1	1	27	31	27	30
30	5.48	1	1	26	29	25	28
40	6.33	1	1	25	28	24	27
50	7.07	1	1	24	27	23	26
75	8.66	1	1	23	25	21	24
100	10.00	1	1	21	24	20	23
125	11.18	0	0	20	23	19	22
150	12.25	0	0	19	22	18	21
175	13.21	0	0	19	21	17	20
200	14.12	0	0	18	21	17	20
225	15.00	0	0	18	20	16	19
250	15.81	0	0	17	20	16	19
275	16.56	0	0	17	19	15	18
300	17.31	0	0	16	19	15	18
350	18.70	0	0	16	18	14	17
400	20.00	0	0	15	18	14	17
450	21.20	0	0	14	17	13	16
500	22.35	0	0	14	17	13	16
600	24.45	0	0	13	16	12	15
700	26.45	10	6	12	15	11	14
800	28.30	10	6	12	14	11	14
900	30.00	10	6	11	14	10	13
1000	31.60	10	6	11	14	10	13
1100	33.20	15	6	11	13	9	12
1200	34.60	15	10	10	13	9	12
1250	35.40	15	10	10	13	9	12
1300	36.00	15	10	10	13	9	12
1400	37.40	15	10	10	12	8	11
1500	38.70	15	10	9	12	8	11
1600	40.00	20	10	9	12	8	10
1700	41.30	20	10	9	12	8	10
1800	42.40	20	10	9	11	2 #10*	10
1900	43.60	20	10	8	11	2 #10*	10
2000	44.70	20	10	8	11	2 #10*	10

\*Wind two #10 wires at the same time and use as 1 wire by connecting the starting ends together and the finish ends together.

**T**RANSFORMERS to suit any requirement can easily be built by carefully following the instructions contained in this article. There are two types of this apparatus, the shell and the core type, both shown in Fig. 2. They differ in that the former has its windings on a center cross-piece of the core and takes less copper, while the latter has the primary coil on one and the secondary on the other leg of the core. Cores may be built up from standard silicon-steel E and I-punchings, obtainable in many sizes, or assembled from strips of No. 26-gauge silicon steel, cut to size with tinner's shears.

The starting point in transformer design is the exact determination of the output required in watts, which is the product of amperes and volts. For example, a 6-volt transformer delivering 20 amp. has an output of 120 watts. Let us assume that we are going to build a shell-type transformer and that the frequency of our 110-volt supply circuit is 60 cycles. Referring to table No. 1, page 1020, you will find that the first column does not give the exact size of transformer desired, one of 120 watts, and therefore the next larger size is selected, which is 150 watts. The turns of wire required for the secondary coil is found by multiplying the turns per volt as given in table No. 1, by the volts required, which in this case is 6 volts times 1.96, or

11.76 turns. The next higher even number, or 12 turns, should be used.

Next, we should determine the size of wire needed for the secondary, which depends on the current to be passed, already known to be 20 amp. Multiply the amperes by 750 for the shell type, or by 1,000 for the core type to find the cross-sectional area of the wire in circular mils. In the example, this would be 15,000. Table No. 6 gives the wire sizes corresponding to the circular-mil area. As the figure 15,000 is not given, take the next one above it,



# TRANSFORMERS

By Clyde A. Crowley

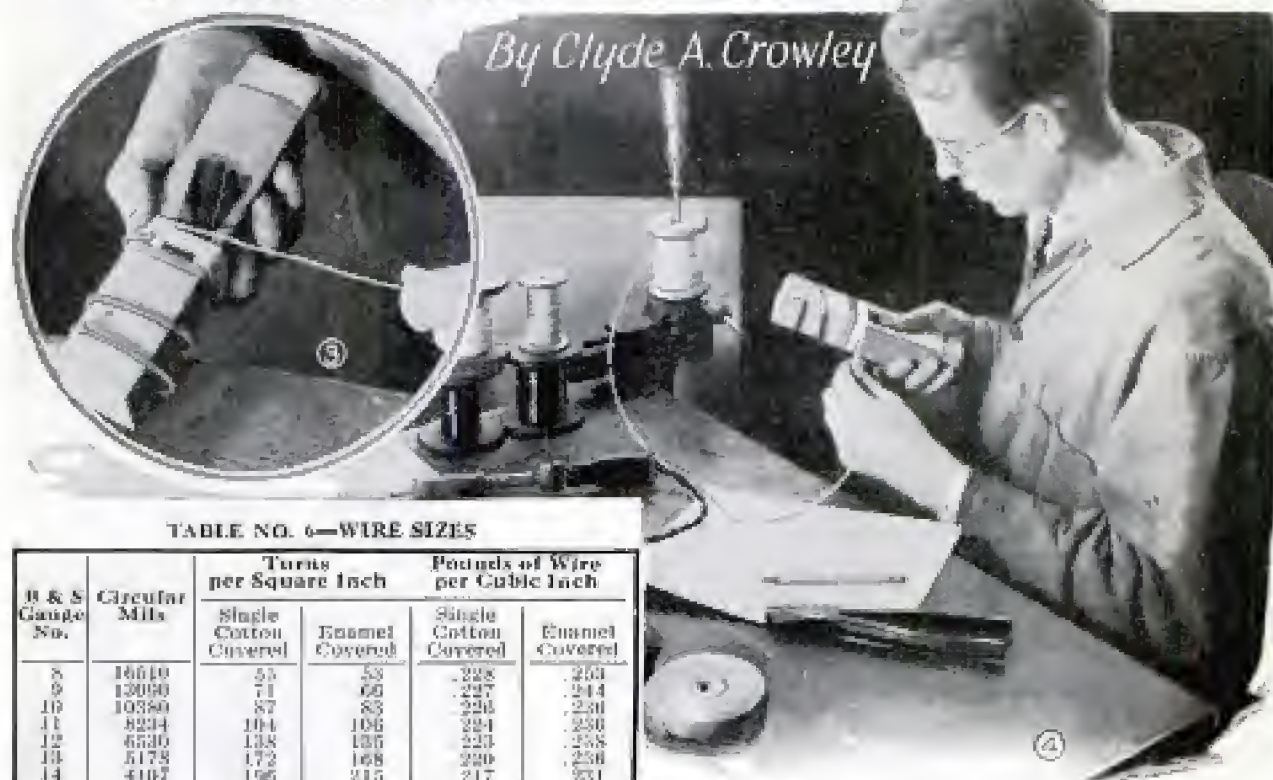


TABLE NO. 6—WIRE SIZES

B. & S. Gauge No.	Circular Mils.	Turns per Square Inch		Pounds of Wire per Cubic Inch	
		Single Cotton Covered	Enamel Covered	Single Cotton Covered	Enamel Covered
8	16610	55	53	.228	.229
9	13090	71	69	.227	.227
10	10360	87	83	.226	.226
11	8234	104	100	.224	.225
12	6530	123	117	.223	.223
13	5178	152	145	.220	.220
14	4107	186	177	.217	.217
15	3257	225	215	.214	.214
16	2583	271	259	.210	.210
17	2048	321	307	.207	.207
18	1624	383	365	.204	.204
19	1288	458	435	.200	.200
20	1022	548	522	.195	.195
21	810	654	625	.190	.190
22	642	784	752	.183	.183
23	509	940	895	.177	.177
24	404	1125	1070	.170	.170
25	320	1346	1280	.164	.164
26	254	1605	1530	.157	.157
27	201	1915	1840	.150	.150
28	158	2280	2180	.143	.143
29	125	2700	2610	.135	.135
30	100	3173	3075	.128	.128
31	79	3695	3560	.120	.120
32	63	4277	4120	.110	.110
33	50	4920	4730	.101	.101
34	39	5625	5400	.093	.093
35	31	6393	6130	.083	.083
36	25	7223	6920	.075	.075

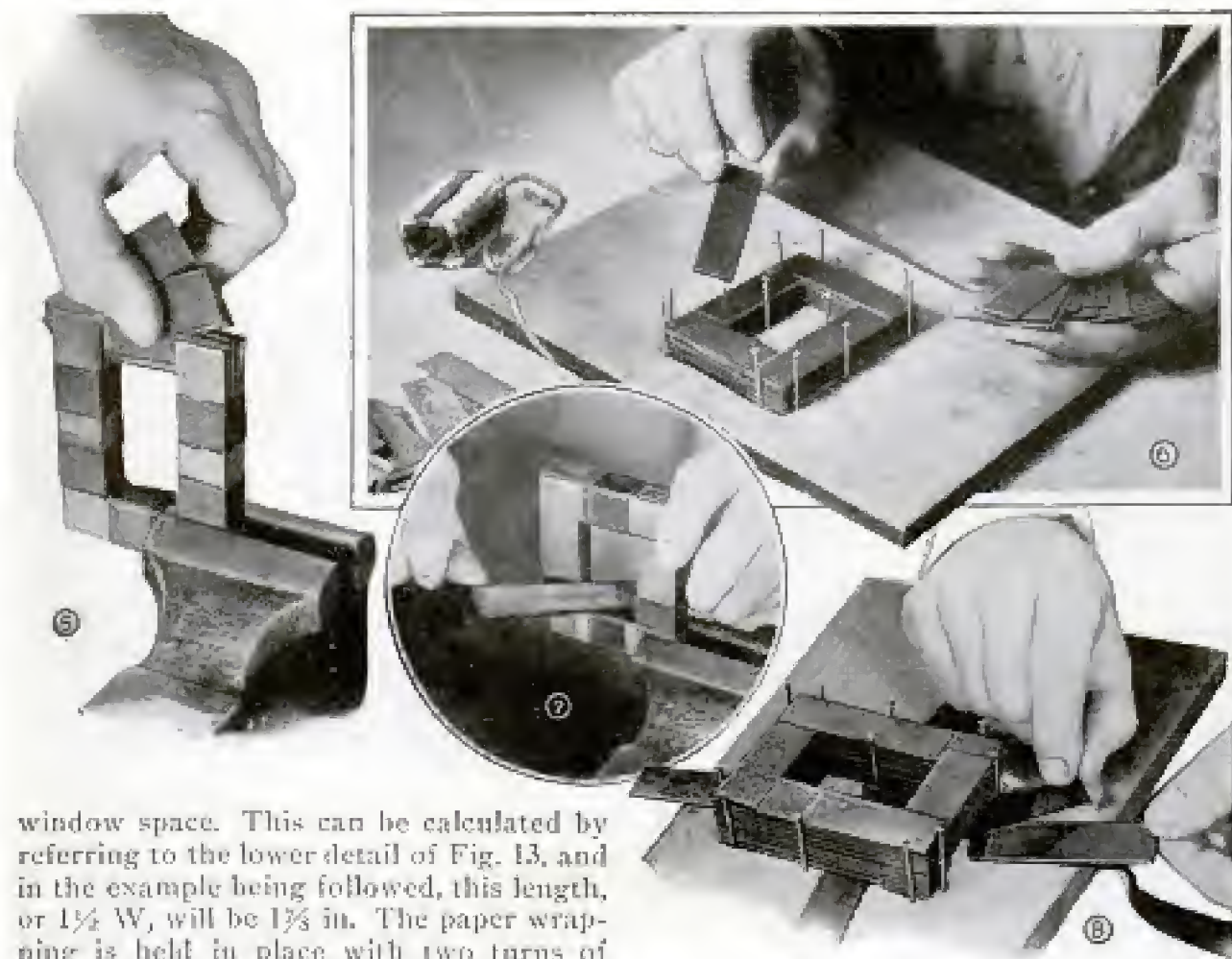
which is 16,510, corresponding to No. 8 wire, which is the correct size to use. How much wire is needed for the secondary coil depends on the size of the core on which it is to be wound, the number of turns already being known. To estimate the weight of wire needed, consult table No. 6, where we find that No. 8 s.c.c. wire will wind 55 turns per square inch. Dividing our turns, or 12, by this number we get .218 sq. in. as the cross-sectional area of the wire on the coil. Multiplying this number by the distance around the core, as found in table No. 1, we get  $8\frac{1}{2}$  times .218, or 1.8, which is the number of cubic inches of wire needed for the coil. Table No. 6 also gives the number of pounds of No. 8 s.c.c. wire per cubic inch as .228. By mul-

tipling this number by 1.8 cu. in. we get .46 lb., or the approximate weight of wire for the secondary coil.

The next step is to find the size of the core and its weight. From table No. 1 we find that the width of the core leg on which the coil is wound should be  $1\frac{1}{4}$  in. This table also gives the thickness of the core as  $2\frac{3}{16}$  in., and the approximate weight of silicon steel required as 5.8 lb. Fig. 13 shows how all the core dimensions are based on the width of the core leg which is indicated by W. It only remains to determine the turns, wire size and weight of wire required for the primary or input coil. Referring again to table No. 1 you will find that there are to be 212 turns, and that the winding will weigh about .9 lb. Refer to table No. 5 to find the size of wire needed, which in this case is No. 19.

The coils are wound on a wooden form, as in Fig. 4. The primary is wound first. The form is cut to a width and thickness slightly greater than the dimensions of the core, which in this case is  $1\frac{1}{4}$  by  $2\frac{3}{16}$  in., and is covered with two or three layers of heavy brown paper for a distance equal to the length of the coil, which in turn is made  $\frac{1}{4}$  in. less than the length of the





window space. This can be calculated by referring to the lower detail of Fig. 13, and in the example being followed, this length, or  $1\frac{1}{2} W$ , will be  $1\frac{1}{8}$  in. The paper wrapping is held in place with two turns of friction tape. If the first and last three turns of each layer of wire are wound over a length of friction tape, and this is doubled back over the coil, as shown in Fig. 3, the end turns will be securely held in place. A thin sheet of tough paper should be wound between layers of wire if space permits. If there is not room for this, use a sheet between every other, or every third, layer. When the primary coil has been completed, cover it with two layers of heavy brown paper and wind on the secondary coil. Great care should be taken to prevent contact between the two coils. When completed, they are slipped off the form and bound with tape, as in Fig. 1. The core is then slipped into the coils, as shown in Fig. 12. After the core and coil have been assembled, they should be impregnated with orange shellac or electrical-coil varnish. If orange shellac is used, dilute it with an equal volume of alcohol. A large can will serve as a dipping tank. Allow the assembly to soak for about 12 hours, after which it is left to dry thoroughly for an equal period. To complete the drying, bake the transformer at a low

heat for 2 or 3 hours. Shell-type transformers may be completed by bolting on a pair of standard pressed-steel end plates obtainable in various sizes corresponding to the core punchings shown in Fig. 12.

Core-type transformers are easily assembled in a jig, as in Fig. 6, the strips being piled alternately, as shown in the detail above table No. 7. The cores must be bound together and securely taped while held in a vise to avoid hum. Figs. 7 and 8 show the steps for binding a core of this type. The coils are wound separately and slipped on each leg of the core, as in Fig. 10. To do this, remove the laminations from one side of the core, as shown in Fig. 5, replacing these, as in Fig. 9, after the coils have been placed in position. A mallet or block is used, as in Fig. 11, to force the laminations down evenly, after which they are taped securely. The transformer may be clamped with channel iron or angle-iron brackets, as shown in Fig. 14, and mounted in a metal box, as in Fig. 16. The cord, which connects the transformer to the supply circuit should be



brought into the can through a porcelain bushing. Low-voltage secondary connections are made to brass screws or binding posts mounted on a fiber or bakelite strip, as in Figs. 16 and 18. Then the can is filled with melted insulating tar, Fig. 17, obtainable at battery-service stations.

If you need a size of transformer not covered in the tables, refer to table No. 5. Locate the desired size, or the nearest one of higher value, in the first column. Opposite this size is a design number needed for figuring the other values. This table also gives the wire size to be used for the primary coil. Let us assume that you want to build a core-type transformer to convert 110 volts to 220 volts on a 60-cycle circuit, and that you will need 5 amp. from the secondary. The watts will be 5 times 220 or 1,100. Consulting table No. 5,

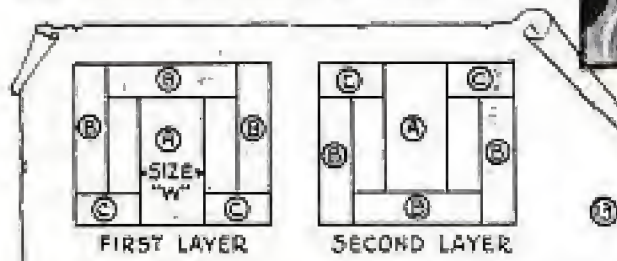
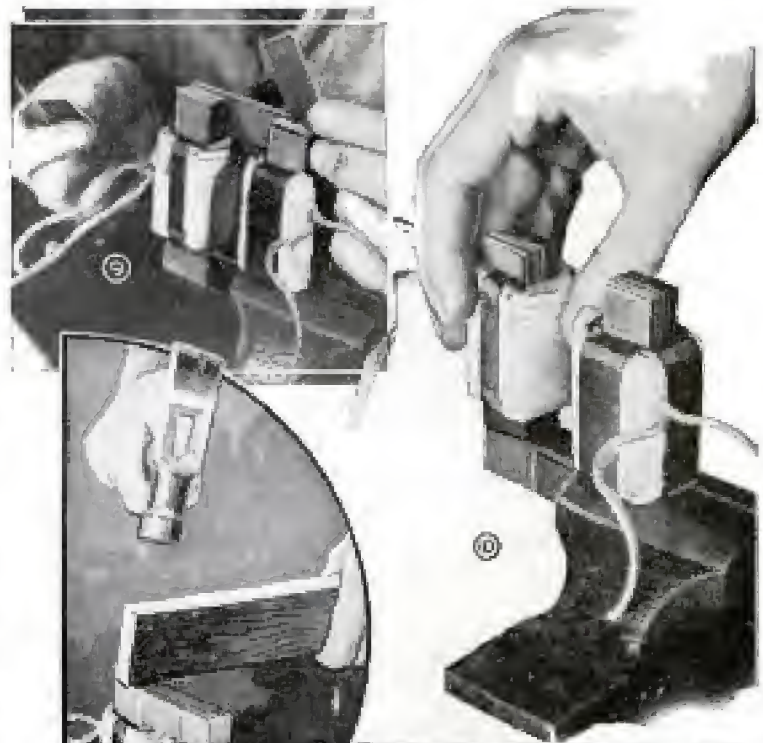
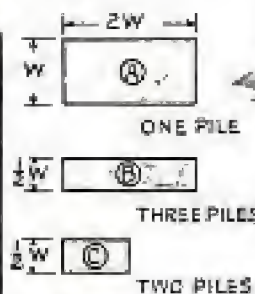


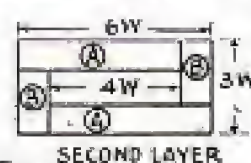
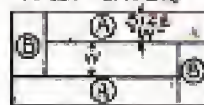
TABLE NO. 7

DIMENSIONS FOR SHELL TYPE OF TRANSFORMER STEEL

Size "W"	Area of 1 Window in Sq. In.	Weight of Core 1" Thick Lb.
3/4	.29	.50
7/8	.42	.75
1	.57	.99
1 1/4	.75	1.30
1 3/4	.92	1.65
1 7/8	1.16	2.03
2	1.41	2.46
2 1/4	1.68	2.92
2 3/4	1.97	3.44
3	2.27	3.96
3 1/4	2.62	4.58
3 3/4	3.00	5.20
4	3.42	5.85
4 1/4	4.70	8.25
4 3/4	5.60	9.50
5	6.70	11.70
5 1/4	9.20	15.90
5 3/4	12.00	20.80
6	15.20	26.40



FIRST LAYER

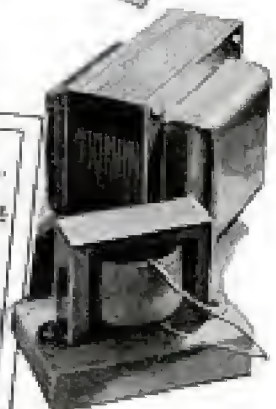
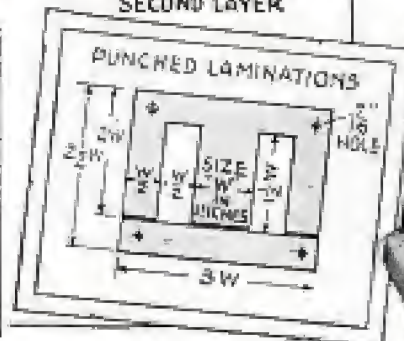


SECOND LAYER

TABLE NO. 8

DIMENSIONS FOR CORE TYPE TRANSFORMER STEEL

Size "W"	Dimensions of Core		Area of Window Sq. In.	Wt. of 1" Thick Core
	A	B		
3/4	3/4 x 4 3/4	3/4 x 1 3/4	3.06	2.9
1	1 x 5	1 x 2	4.00	3.8
1 1/4	1 1/4 x 5 1/4	1 1/4 x 2 1/4	5.06	4.8
1 1/2	1 1/2 x 6 1/2	1 1/2 x 2 1/2	6.25	5.9
1 3/4	1 3/4 x 6 3/4	1 3/4 x 2 3/4	7.55	7.2
1 7/8	1 7/8 x 7 1/8	1 7/8 x 3	9.00	8.6
2	2 x 8 1/4	2 x 3 1/4	10.00	10.1
2 1/4	2 1/4 x 8 1/4	2 1/4 x 3 1/4	12.5	11.6
2 3/4	2 3/4 x 9 1/4	2 3/4 x 3 3/4	14.1	13.3
3	3 x 10	3 x 4	16.0	15.2
3 1/4	3 1/4 x 11 1/4	3 1/4 x 4 1/4	20.25	19.1





SHELL-TYPE TRANSFORMERS, TABLE No. 1-50 TO 133 CYCLES

Size of Transformer in Watts	Primary Coil					Secondary Coil					Dimensions for Silicon-Steel Core				
	For 110 Volts	For 220 Volts	Approximate Wt. of Wire in Pounds	Turns of Wire	Approximate Wt. of Wire in Pounds	Turns of Wire	Approximate Wt. of Wire in Pounds	Turns of Wire	Approximate Wt. of Wire in Pounds	Turns of Wire	Turns per Volt for Secondary Coil	Approximate Wt. of Wire in Pounds	Turns of Wire	Approximate Wt. of Wire in Pounds	Turns of Wire
50	365	730	0.4	3.40	0.4	3.40	0.4	3.40	0.4	3.40	3.40	0.4	3.40	0.4	3.40
100	360	720	0.6	2.40	0.6	2.40	0.6	2.40	0.6	2.40	2.40	0.6	2.40	0.6	2.40
150	312	624	1.0	1.70	1.0	1.70	1.0	1.70	1.0	1.70	1.70	1.0	1.70	1.0	1.70
200	284	568	1.3	1.30	1.3	1.30	1.3	1.30	1.3	1.30	1.30	1.3	1.30	1.3	1.30
250	264	528	1.6	1.10	1.6	1.10	1.6	1.10	1.6	1.10	1.10	1.6	1.10	1.6	1.10
300	250	500	1.9	0.90	1.9	0.90	1.9	0.90	1.9	0.90	0.90	1.9	0.90	1.9	0.90
350	238	476	2.2	0.80	2.2	0.80	2.2	0.80	2.2	0.80	0.80	2.2	0.80	2.2	0.80
400	228	456	2.5	0.70	2.5	0.70	2.5	0.70	2.5	0.70	0.70	2.5	0.70	2.5	0.70
450	218	436	2.8	0.60	2.8	0.60	2.8	0.60	2.8	0.60	0.60	2.8	0.60	2.8	0.60
500	208	416	3.1	0.50	3.1	0.50	3.1	0.50	3.1	0.50	0.50	3.1	0.50	3.1	0.50
550	198	396	3.4	0.40	3.4	0.40	3.4	0.40	3.4	0.40	0.40	3.4	0.40	3.4	0.40
600	188	376	3.7	0.30	3.7	0.30	3.7	0.30	3.7	0.30	0.30	3.7	0.30	3.7	0.30
650	178	356	4.0	0.20	4.0	0.20	4.0	0.20	4.0	0.20	0.20	4.0	0.20	4.0	0.20
700	168	336	4.3	0.10	4.3	0.10	4.3	0.10	4.3	0.10	0.10	4.3	0.10	4.3	0.10
750	158	316	4.6	0.05	4.6	0.05	4.6	0.05	4.6	0.05	0.05	4.6	0.05	4.6	0.05
800	148	296	4.9	0.02	4.9	0.02	4.9	0.02	4.9	0.02	0.02	4.9	0.02	4.9	0.02
850	138	276	5.2	0.01	5.2	0.01	5.2	0.01	5.2	0.01	0.01	5.2	0.01	5.2	0.01
900	128	256	5.5	0.005	5.5	0.005	5.5	0.005	5.5	0.005	0.005	5.5	0.005	5.5	0.005
950	118	236	5.8	0.002	5.8	0.002	5.8	0.002	5.8	0.002	0.002	5.8	0.002	5.8	0.002
1000	108	216	6.1	0.001	6.1	0.001	6.1	0.001	6.1	0.001	0.001	6.1	0.001	6.1	0.001
1050	98	196	6.4	0.0005	6.4	0.0005	6.4	0.0005	6.4	0.0005	0.0005	6.4	0.0005	6.4	0.0005
1100	88	176	6.7	0.0002	6.7	0.0002	6.7	0.0002	6.7	0.0002	0.0002	6.7	0.0002	6.7	0.0002
1150	78	156	7.0	0.0001	7.0	0.0001	7.0	0.0001	7.0	0.0001	0.0001	7.0	0.0001	7.0	0.0001
1200	68	136	7.3	0.00005	7.3	0.00005	7.3	0.00005	7.3	0.00005	0.00005	7.3	0.00005	7.3	0.00005
1250	58	116	7.6	0.00002	7.6	0.00002	7.6	0.00002	7.6	0.00002	0.00002	7.6	0.00002	7.6	0.00002
1300	48	96	7.9	0.00001	7.9	0.00001	7.9	0.00001	7.9	0.00001	0.00001	7.9	0.00001	7.9	0.00001

EASY METHOD OF FIGURING VALUES FOR OTHER SIZES

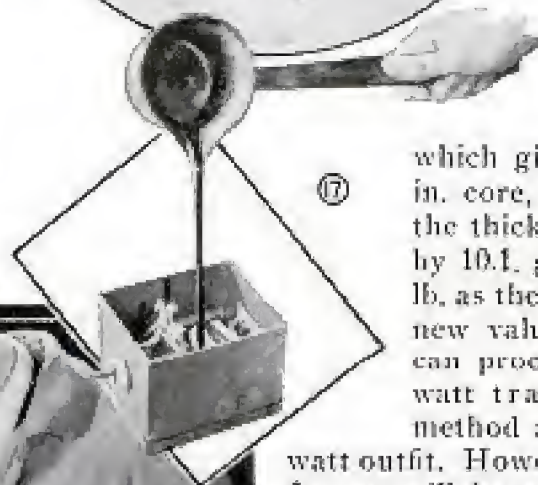
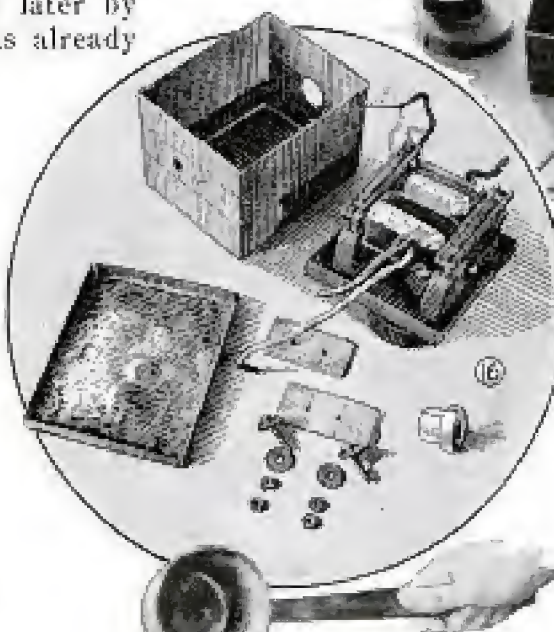
Select Size to Suit Purpose	See Table No. 0 for Pounds per Cable Inch	See Table No. 0 for Design No.	See Table No. 0 for Turns per Cable Inch	See Table No. 0 for Design No.	See Table No. 0 for Turns per Cable Inch	See Table No. 0 for Design No.	See Table No. 0 for Turns per Cable Inch	See Table No. 0 for Design No.	See Table No. 0 for Turns per Cable Inch	See Table No. 0 for Design No.	See Table No. 0 for Turns per Cable Inch	See Table No. 0 for Design No.	See Table No. 0 for Turns per Cable Inch	See Table No. 0 for Design No.	See Table No. 0 for Turns per Cable Inch
2,000	2.00	24	2.00	24	2.00	24	2.00	24	2.00	24	2.00	24	2.00	24	2.00
4,000	4.00	48	4.00	48	4.00	48	4.00	48	4.00	48	4.00	48	4.00	48	4.00
6,000	6.00	72	6.00	72	6.00	72	6.00	72	6.00	72	6.00	72	6.00	72	6.00
8,000	8.00	96	8.00	96	8.00	96	8.00	96	8.00	96	8.00	96	8.00	96	8.00
10,000	10.00	120	10.00	120	10.00	120	10.00	120	10.00	120	10.00	120	10.00	120	10.00
12,000	12.00	144	12.00	144	12.00	144	12.00	144	12.00	144	12.00	144	12.00	144	12.00
14,000	14.00	168	14.00	168	14.00	168	14.00	168	14.00	168	14.00	168	14.00	168	14.00
16,000	16.00	192	16.00	192	16.00	192	16.00	192	16.00	192	16.00	192	16.00	192	16.00
18,000	18.00	216	18.00	216	18.00	216	18.00	216	18.00	216	18.00	216	18.00	216	18.00
20,000	20.00	240	20.00	240	20.00	240	20.00	240	20.00	240	20.00	240	20.00	240	20.00
22,000	22.00	264	22.00	264	22.00	264	22.00	264	22.00	264	22.00	264	22.00	264	22.00
24,000	24.00	288	24.00	288	24.00	288	24.00	288	24.00	288	24.00	288	24.00	288	24.00
26,000	26.00	312	26.00	312	26.00	312	26.00	312	26.00	312	26.00	312	26.00	312	26.00
28,000	28.00	336	28.00	336	28.00	336	28.00	336	28.00	336	28.00	336	28.00	336	28.00
30,000	30.00	360	30.00	360	30.00	360	30.00	360	30.00	360	30.00	360	30.00	360	30.00
32,000	32.00	384	32.00	384	32.00	384	32.00	384	32.00	384	32.00	384	32.00	384	32.00
34,000	34.00	408	34.00	408	34.00	408	34.00	408	34.00	408	34.00	408	34.00	408	34.00
36,000	36.00	432	36.00	432	36.00	432	36.00	432	36.00	432	36.00	432	36.00	432	36.00
38,000	38.00	456	38.00	456	38.00	456	38.00	456	38.00	456	38.00	456	38.00	456	38.00
40,000	40.00	480	40.00	480	40.00	480	40.00	480	40.00	480	40.00	480	40.00	480	40.00
42,000	42.00	504	42.00	504	42.00	504	42.00	504	42.00	504	42.00	504	42.00	504	42.00
44,000	44.00	528	44.00	528	44.00	528	44.00	528	44.00	528	44.00	528	44.00	528	44.00
46,000	46.00	552	46.00	552	46.00	552	46.00	552	46.00	552	46.00	552	46.00	552	46.00
48,000	48.00	576	48.00	576	48.00	576	48.00	576	48.00	576	48.00	576	48.00	576	48.00
50,000	50.00	600	50.00	600	50.00	600	50.00	600	50.00	600	50.00	600	50.00	600	50.00
52,000	52.00	624	52.00	624	52.00	624	52.00	624	52.00	624	52.00	624	52.00	624	52.00
54,000	54.00	648	54.00	648	54.00	648	54.00	648	54.00	648	54.00	648	54.00	648	54.00
56,000	56.00	672	56.00	672	56.00	672	56.00	672	56.00	672	56.00	672	56.00	672	56.00
58,000	58.00	696	58.00	696	58.00	696	58.00	696	58.00	696	58.00	696	58.00	696	58.00
60,000	60.00	720	60.00	720	60.00	720	60.00	720	60.00	720	60.00	720	60.00	720	60.00
62,000	62.00	744	62.00	744	62.00	744	62.00	744	62.00	744	62.00	744	62.00	744	62.00
64,000	64.00	768	64.00	768	64.00	768	64.00	768	64.00	768	64.00	768	64.00	768	64.00
66,000	66.00	792	66.00	792	66.00	792	66.00	792	66.00	792	66.00	792	66.00	792	66.00
68,000	68.00	816	68.00	816	68.00	816	68.00	816	68.00	816	68.00	816	68.00	816	68.00
70,000	70.00	840	70.00	840	70.00	840	70.00	840	70.00	840	70.00	840	70.00	840	70.00
72,000	72.00	864	72.00	864	72.00	864	72.00	864	72.00	864	72.00	864	72.00	864	72.00
74,000	74.00	888	74.00	888	74.00	888	74.00	888	74.00	888	74.00	888	74.00	888	74.00
76,000	76.00	912	76.00	912	76.00	912	76.00	912	76.00	912	76.00	912	76.00	912	76.00
78,000	78.00	936	78.00	936	78.00	936	78.00	936	78.00	936	78.00	936	78.00	936	78.00
80,000	80.00	960	80.00	960	80.00	960	80.00	960	80.00	960	80.00	960	80.00	960	80.00
82,000	82.00	984	82.00	984	82.00	984	82.00	984	82.00	984	82.00	984	82.00	984	82.00
84,000	84.00	1008	84.00	1008	84.00	1008	84.00	1008	84.00	1008	84.00	1008	84.00	1008	84.00
86,000	86.00	1032	86.00	1032	86.00	1032	86.00	1032	86.00	1032	86.00	1032	86.00	1032	86.00
88,000	88.00	1056	88.00	1056	88.00	1056	88.00	1056	88.00	1056	88.00	1056	88.00	1056	88.00
90,000	90.00	1080	90.00	1080	90.00	1080	90.00	1080	90.00	1080	90.00	1080	90.00	1080	90.00
92,000	92.00	1104	92.00	1104	92.00	1104	92.00	1104	92.00	1104	92.00	1104	92.00	1104	92.00
94,000	94.00	1128	94.00	1128	94.00	1128	94.00	1128	94.00	1128	94.00	1128	94.00	1128	94.00
96,000	96.00	1152	96.00	1152	96.00	1152	96.00	1152	96.00	1152	96.00	1152	96.00	1152	96.00
98,000	98.00	1176	98.00	1176	98.00	1176	98.00	1176	98.00	1176	98.00	1176	98.00	1176	98.00
100,000	100.00	1200	100.00	1200	100.00	1200	100.00	1200	100.00	1200	100.00	1200	100.00	1200	100.00

CORE-TYPE TRANSFORMERS, TABLE No. 3-50 TO 133 CYCLES

||
||
||



you find the design number for 1,100 watts to be 33.20, and that the primary coil should be wound with No. 9 wire. Remembering this, you turn to table No. 3, which contains formulas for calculating 60-cycle, core-type transformers. In the space under the first column listing the size in watts, write 1,100, which you have already found. For the second column divide the design number, or 33.20, as found in table No. 5, into 8,200 and you will get 247 for the number of primary turns. The weight of primary wire for the next column, and the weight of secondary wire may be calculated later by the same method as has already been outlined. The secondary turns per volt is next determined by dividing 75 by the design number, in this case 33.20, which gives 2.25. Likewise, multiplying .093 of the next column by 33.20 gives 3.08 for the cross-sectional area of the core. To decide on a core size, look up the column and select a size proportional to those given for other sizes of transformers. In this case  $1\frac{5}{8}$  in. will be satisfactory. The thick-



ness of core needed can now be figured by dividing the area already found, or 3.08, by the core size, or  $1\frac{5}{8}$  in., which gives 1.89, although we can use a  $1\frac{15}{16}$ -in. core to make it even. The weight of steel needed can be found by referring to table No. 8,

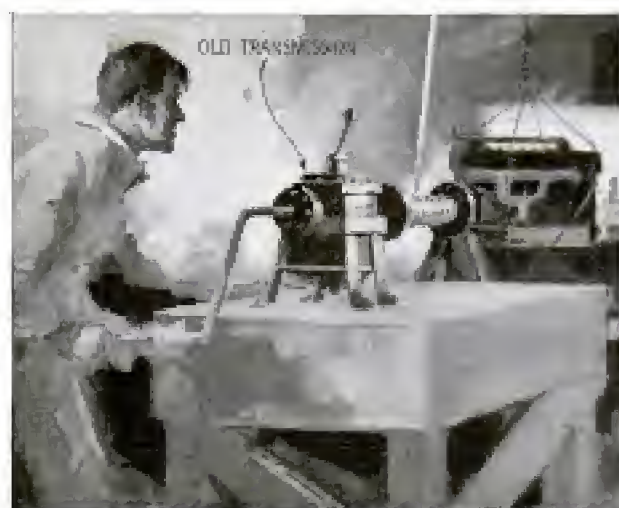
which gives the weight of a  $1\frac{5}{8}$ -in. core, 1 in. thick. Multiplying the thickness of the core, or  $1\frac{15}{16}$  by 10.1, gives approximately  $19\frac{1}{2}$  lb. as the core weight. With these new values for table No. 3, you can proceed to design the 1,100-watt transformer by the same method as was used for the 150-

watt outfit. However, the 1,100-watt transformer will have more turns on the secondary than on the primary, and is therefore a step-up transformer. Special care should be used to assure good insulation when high-voltage coils are built.

When designing transformers, one should always check the window space of the core to make sure that it is large enough. If the coil requires more space,

(Continued to page 140A)





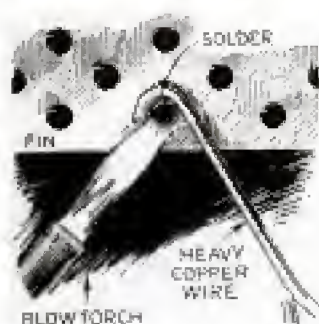
This Three-Speed Hoist Handles Heavy Loads with Ease, and Light Loads Speedily

### Hoist Improvised from Transmission Has Three Speeds

A three-speed hoist can be improvised from an old auto transmission. A large crank is fitted to the front end of the transmission, leaving the driveshaft and universal joint on the other end. The shaft is cut off, allowing enough to project to serve as a drum for the hoisting cable. A bearing is provided for the outer end of the shaft. When mounted on a heavy table as shown, and used in connection with a pulley or a block and tackle, this hoist will handle heavy loads in low gear, or by changing to high gear, light loads can be raised speedily.

### Soldering Tool for Radiator Tubes

In order to repair one of the tubes in my radiator that could not be reached with a soldering iron, I made the illustrated tool. It is a length of heavy copper wire with one end bent to form a hook which will fit the curvature of the tubes.



In use, the fins of the radiator are spread apart, the tube is scraped clean and solder is applied. When the solder melts it is spread over the hole with the wire tool, the hook having been previously tinned.—Arnie Hongo, McNeal, Arizona.

### Suggested Thicknesses for Applying Cork Insulation

After considerable experimenting, I have found molded cork to be best as an insulator to prevent water pipes from sweating. The correct thickness of the cork depends on the degree of humidity in the air. The greater the humidity, the greater will be the thickness of cork required. For average conditions, a thickness of  $1\frac{1}{2}$  in. is satisfactory, but where the humidity is high,  $2\frac{1}{2}$  in. is frequently necessary. There is no rule which will take care of all conditions because of other factors involved, such as the temperature of the air and of the liquid in the pipe, etc. Computation of correct thickness should take into consideration all of these factors.—W. F. Schaphorst, M. E., Newark, N. J.

### Coil Springs Protect Sensitive Devices Against Vibration

In engine rooms where a steady vibration is set up by the machinery, it is a good idea to mount such devices as clocks, thermometers and meters on springs. Three long nails will serve as pivots for attachment of the springs. This method is also useful in boat cabins, where the vibration is severe, for mounting chronometers and barometers, or other sensitive instruments.



### Spring Tail Skid Substituted for Shock Cord on Airplane

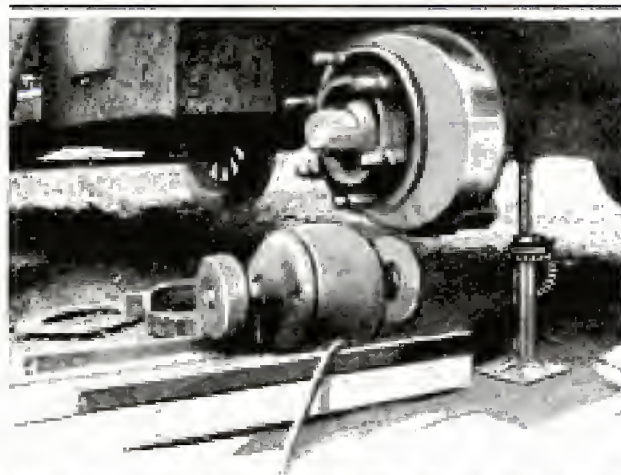
Inconveniences, arising from broken shock cords on tail skids of airplanes, can be overcome by substituting a spring for the regular skid. An old semielliptical car spring will do for this purpose, using three or four leaves  $1\frac{1}{2}$  to 2 in. wide. After removing the old skid, weld a plate of  $\frac{1}{4}$  or  $\frac{1}{2}$ -in. stock between the frames close to the tail post, to prevent tube distortion and to provide a means of attaching the



spring. Then perforate the center of the plate to take a  $\frac{3}{8}$ -in. bolt, drilling similar holes in the spring to correspond with those in the plate and the old skid bracket. When the necessary alignments have been made, bolt the spring in place temporarily. Then, resting the tail on it, determine the tension necessary to provide the proper clearance between the plane and the ground, taking into consideration such stress as occurs when "revving up" with a back stick or when taking off from or landing on rough ground. The spring is then removed and bent to the proper shape, forming a shoe on the thinner end, after which a spring clip is riveted or brazed 1 in. from the end of the main leaf of the spring, to provide a guide and prevent ground looping. Casehardened bolts should be used for attaching the skid to the tail frame.—Leo May, Chicago.

#### Portable Setup for Grinding Brake Drums without Removing Them

Faced by the problem of truing up rough brake drums, an Arkansas mechanic devised the following method of doing the job without even removing the drums. He screwed two strips of light angle iron to a heavy board to form ways for a small bench grinder. After jacking up one side of the axle and removing the wheel and outer brake band, he placed the grinder in position directly under the drum. The car motor was then run in low or reverse while the grinder was worked back and forth across the surface of the drum. Ground in this manner, the drums will be concentric with the axles.



Truck and Car Brake Drums Can Be Trued with a Small Portable Grinder



Sturdy Rack for Welding Torch Is Fitted with Pilot Light and Flame Guard

#### Rack Equipped with Pilot Light Holds Welder's Torch

Fitted with a pilot light, this rack will be found handy for holding a welding torch. The base is a gear or a wheel, which supports a vertical length of pipe. Two small rods are bent as shown and inserted into the end of the pipe to hold the torch, while a large ring, clamped near the top, serves as a guard around the flame. The light, which is clamped to the vertical pipe, is a piece of tubing plugged at the lower end and fitted with a wick at the top. One filling of denatured alcohol will keep the light burning for hours.

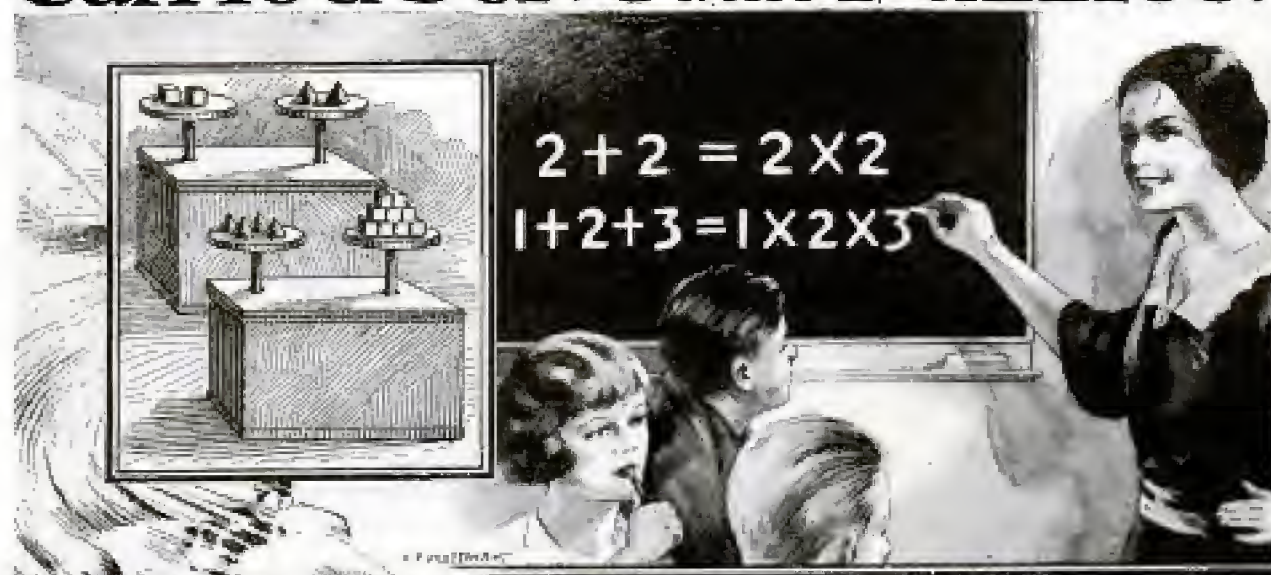
#### Scale on Paper Hanger's Brush Saves Time

Paper hangers will find that considerable time spent in picking up and using a yardstick can be saved by providing a scale on both sides of the smoothing brush. This can be done by first marking the lines with a pencil and then sawing them out deep enough so they will not be obliterated. Numerals may be stamped in with steel dies.—S. E. Schofield, Indianapolis, Ind.



031310

# Can You Solve *these* Puzzles?



"ALTHOUGH two is an even figure, it is quite an oddity," said Mrs. Terwilliger to her class, "two being the only digit which, added to or multiplied by itself will give the same result. If we wish to produce that effect with three figures, we have to take one, two and three. Multiplied or added together they produce six. Now, I have led you to the puzzle: What four digits, either added or multiplied together, will produce the same result? Two or more of the four figures may be alike."

TUNING up for a big race, a driver was on the track for exactly one hour. He raced the first quarter of his entire run at a speed of 100 miles an hour; covered the second fourth at ninety miles an hour; the third at eighty miles an hour, and the last part at the rate of sixty miles an hour. Note that the quarters indicate distance and not time. What was his total mileage for the hour?

1531 By SAM LOYD  
OUR sketch shows two views of the same pair of "doctored" scales, the fulcrum having been shifted so that one side has greater leverage than the other. To keep the pans in balance when empty, the shorter arm is weighted. The scales are set in a box to mask this. In the upper view are two cubes in balance with two cones. In the lower, four cones balance against nine cubes. The problem for you to solve is to determine how many of those cubes it would take to balance with six cones, if weighed on a pair of true scales.

## Answers to Last Month's Puzzles

While the triangles are not numbered in the puzzle picture, their general shape plainly indicates to which each set of dimensions applies. The lengths of their sides expressed in feet are: (1) 48, 140 and 148; (2) 80, 84 and 116; (3) 30, 224 and 226.

The solution of the problem regarding the cost of each bidder's work is: The paperhanger's estimate amounted to \$440; the painter's was \$750; the plumber's, \$1,400; the electrician's \$660; the carpenter's \$3,325, and the mason's \$1,275.



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# A plain statement ANTI-

## IMPORTANT INFORMATION FOR THE

**In an effort to clear up the confusion regarding anti-freeze, which appears to exist in the minds of many consumers, we give below the outstanding facts. The following statements are guaranteed to be correct and accurate in every particular. They are supported by the highest scientific authorities.**

THE problem of preventing freezing in the cooling-systems of automobiles during the cold weather months was one that taxed the ingenuity of car owners for many years. Salt, honey, alcohol, kerosene, glycerine and many other products and by-products were used with varying success. Within the past few years, however, there has been developed a new product, a product specially designed for this one use and purpose.

That product is Eveready Prestone. It is not a general commodity used principally for other purposes: it is an anti-freeze, and nothing else. It is a scientific development, thoroughly approved by all car manufacturers; a product which embodies all the advantages of all materials previously used, with none of their inherent weaknesses.

In developing Eveready Prestone, the laboratories of Union Carbide and Carbon Corporation, keeping in mind the requirements of the U. S. Bureau of Standards for an ideal anti-freeze, worked toward a product which would satisfy the following specifications:

**1. It must not boil away.** A boil-away anti-freeze is both an inconvenience and a

poor protector against sudden changes in the weather. Such anti-freeze requires frequent renewals, and leaves the car unprotected when a cold snap follows warm weather.

**2. It must be harmless to the cooling-system.** An anti-freeze which corrodes the cooling-system is a poor product to put in a car.

**3. It must be effective in preventing freezing.** The effectiveness of the materials commonly used before the advent of Eveready Prestone varied over a wide range. Some were effective in preventing freezing; others were not.

**4. It must not affect the car finish.** The fumes of boil-away products were a source of danger to the finish of fine cars. This was a weakness which those who developed Eveready Prestone were anxious to avoid.

**5. It must circulate freely at the lowest operating temperatures.** A heavy, viscous material, which is not free-flowing, is obviously a poor cooling agent.

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# of facts concerning FREEZE

## PROTECTION OF CAR OWNERS

**6. It must be non-inflammable and odorless.** Winter driving was often made unpleasant by smelly fumes, while inflammable mixtures held the possibility of causing serious accidents.

**7. It must not "creep."** Certain materials in common use had a strong tendency to leak out of systems which were tight enough to hold water but not tight enough to hold these materials. The new product, it was felt, must have *less tendency to leak than water*. Consequently, if a car could hold water it would hold the anti-freeze.

**8. It must be packaged as a concentrated product.** Many of the products which the public was using, because of their thick, heavy nature in the concentrated form, were sold as water-diluted solutions. The cost of canning and shipping plain water was thus borne by the public. Obviously, if a concentrated product could be packaged and sold the user could be saved that expense. Furthermore, the public had no way of telling how much of these diluted solutions was anti-freeze material and how much was ordinary water. Some brands contained as much as 55% plain water; others contained less. It was decided, therefore, that the new product must be concentrated. Thus the public could be sure of buying a standard product, always the same and always of known value.

**9. It must be economical.** The laboratories which developed the new product were not interested in low first-cost per

gallon. They *were* interested in low cost per season. It was felt that car owners who had been buying boil-away anti-freeze on the installment plan, a few quarts at a time, would not object to a relatively high first-cost if the *all-season* cost were low. The new product, therefore, was priced to cost, for an average winter season, no more than the cost of boil-away anti-freeze.

Thus was developed Eveready Prestone, the only anti-freeze which meets *all* these requirements. But laboratory effort did not stop with that.

### A NEW AND IMPROVED PRODUCT AT A LOWER PRICE

Further research developed the product to a point where it gave protection, not only against freezing but also against rust and corrosion in the cooling-system. And such is the *new* Eveready Prestone. Its use reduces the corrosive action of water on the metals of the cooling-system as follows: brass, copper, solder, aluminum and zinc, 75%; cast iron, 95%; No other "treated" anti-freeze compares with Eveready Prestone for the prevention of rust and corrosion.

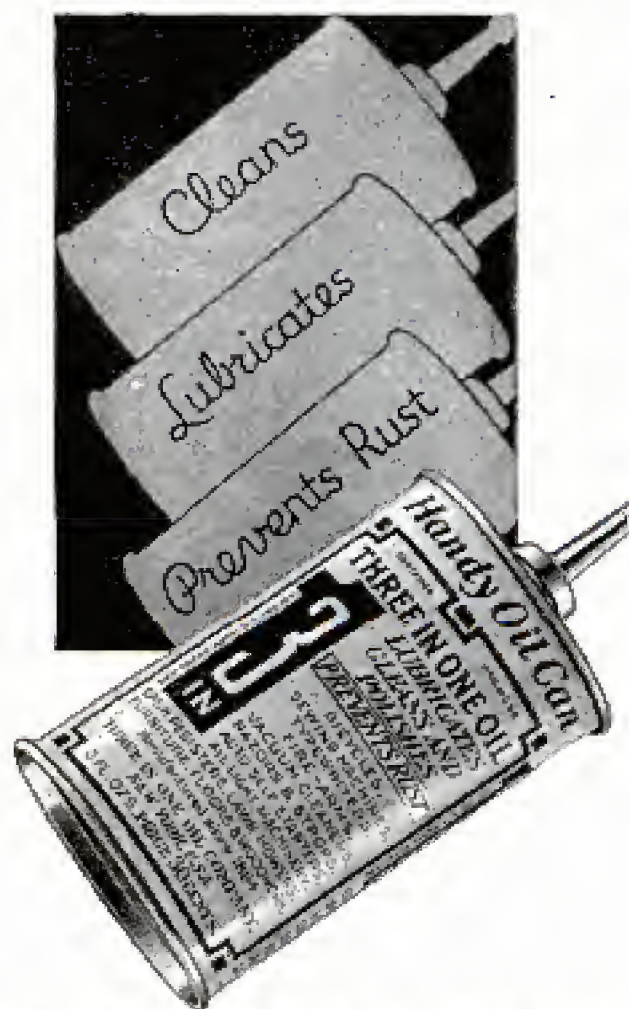
The new Eveready Prestone has been reduced in price. It now offers by far the safest and most economical protection against both freezing and corrosion. The car owner who uses Eveready Prestone is assured of complete protection through all weather changes, freedom from rust and the trouble of replacements, and a clean, free radiator. He insures his car, not only against a freeze-up, but also against the corrosion that follows a rust-clogged and corroded cooling system. He prolongs the life of his car.

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Here's an oil that saves you many a repair and replacement bill by providing *triple protection* for all shop equipment.

Three-in-One is specially blended from three good oils, so it does three good jobs. As it *lubricates* it *cleans* gum-forming dirt from working parts, then *prevents rust*. No ordinary oil can provide this protection so *thoroughly*. Handy cans and bottles, at stores everywhere.

—One Oil Company, New York

## '-ONE OIL

### SECRETS OF THE LION MEN

(Continued from page 925)

burning branches with their spears so we could pass through. Xipooso, calm and proud as ever, welcomed me with poise, but the rest of his family huddled about me weeping and shrieking.

Xipooso had no notion of what was to be done except that he intended to fight the lions until they killed him. What could I do? The fire was rapidly destroying the fence and I could not defend a circular front of some 300 yards single-handed. Then I saw the milling cattle and I had an idea—and it was time to get one.

I gave an order which was at once executed: A fat cow was led through the gap made by our entrance and turned loose. It was cruel, of course, but the sacrifice of this unlucky animal appeared our only salvation. The cow trotted about for a moment, bawled pitcously and stood still. I did not have the heart to see the living creature torn to pieces, so fired a merciful bullet into its head. It had not struck the ground before four, five, ten bodies hurtled through the air and pounced upon it, fighting, snarling and roaring.

The scene, only fifty paces distant, was illuminated by the flames and the lions were perfect targets. I fired once, twice, three times and with each shot a beast spun around and dropped. Two more, badly wounded, tried to hurl themselves in our direction, but lost courage and fled. The flames were dying down, but the continued shooting, the noise and the fire discouraged the circle of beasts about the inclosure, and finally, pair after pair of eyes vanished as the animals retreated to the bush.

Even before I stopped shooting, the chief's family sensed victory and pounced on me with pathetic protestations of gratitude, hailing me as the "big hunter who killed all the lions in the world." Meanwhile the tom-tom was pounding out into space I don't know what extraordinary and exaggerated account of the affair.

Partly as a reward for this exploit, Xipooso made a most unexpected proposal. I was to become a member of the Bantu-Simba Voodoo—the secret society of the lion men—made up of the most intrepid lion hunters in the country. The

(Continued to page 126A)



# Life's greatest THRILL

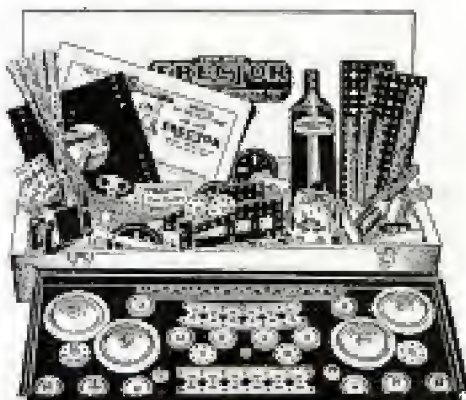


*A.C. Gilbert*

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*A.C. Gilbert*



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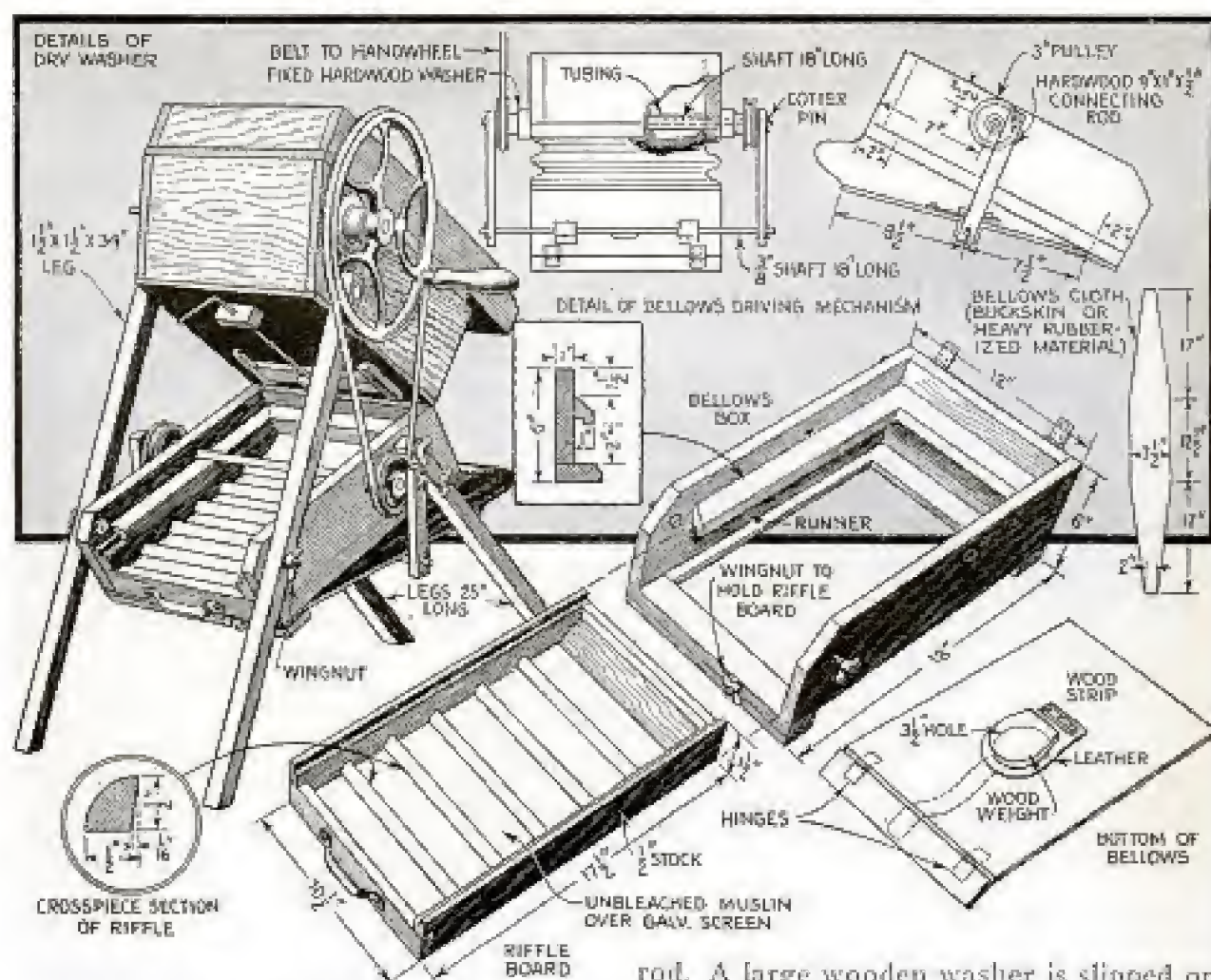
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## GOLD WASHERS INCREASE PROSPECTORS' EARNINGS

(Continued from page 1009)

recovery of the gold. The quantity of gold that can be recovered from a cubic yard of dirt by panning is first estimated. If the machine does not collect this amount, change the slant of the riffle board and the distance between the riffles. Several hours spent in experimenting will be well repaid.

The dry washer has the advantages of light weight and portability. In use, the dirt is moved over the riffle board by air forced up from a bellows. The assembly is fastened together with 1-in. brass screws. Half hinges are placed both at the top and bottom of the unslanted end of the hopper. An adjustable opening in the bottom of the hopper controls the amount of dirt that descends to the riffle board, the width of the slot being governed by a gate which is operated with a rod. Two  $\frac{1}{2}$ -in. holes are drilled through the sides of the hopper, for a 12-in. length of brass tubing, which serves as bearing for a steel

rod. A large wooden washer is slipped on each end of the rod, while a sewing-machine treadle wheel, fitted with a handle, is keyed to one end of the shaft and a collar is setscrewed on the other end. A hopper cover, having three sides, is fitted with a bottom made of  $\frac{1}{4}$ -in.-mesh galvanized screen. Half hinges, to meet the half hinges on the front of the hopper, are attached, and the two parts are united with a long wire through both hinges. The bellows frame, in which the riffle board is to be placed, is made of 1-in. stock. Hinges at the top of the back connect with the half hinges on the bottom of the hopper. The two sides and back of the bellows frame are mounted on a frame of 1-in. stock, 2 in. wide. Runners are nailed inside the box to hold the riffle board when air is forced up from below. Holes are drilled through the sides of the bellows box, and a brass tube, shaft, washers and two 3-in. pulleys are fitted on, while a wingbolt is attached to the front of the bellows box to keep the riffle board from sliding out. The bottom of the bellows box consists of a  $\frac{1}{4}$ -in. board with a  $3\frac{1}{2}$ -in. clapper hole.

(Continued to page 142A)



# NEW ANTI-FREEZE GIVES 4-WAY PROTECTION



★ Won't evaporate . . . fill now for the winter

★ Leaks less than water

★ Stops rusting and corrosion

★ Positively will not clog or gum

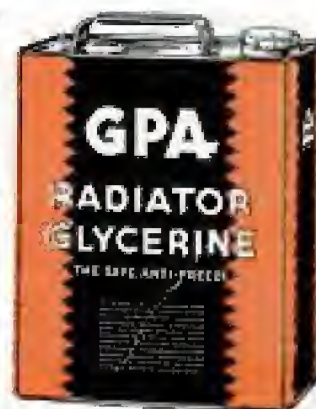
*PLUS* lower price . . . more economical than ever

## 14 ADVANTAGES OF G. P. A.

1. Gives complete protection against freeze-ups to 30° below zero.
2. Will not evaporate—not even on the warmest days. One filling lasts all winter.
3. Leaks less than water.
4. Protects all metals of the cooling system against corrosion and the rust caused by tap water. This protection continues after G. P. A. is drained out.
5. Retards disintegration of rubber hose.
6. Positively will not clog or gum radiator.
7. Mixes quickly and permanently with water.
8. Never overheats motor—even on warmest days.
9. Does not injure Duco or other automobile finishes.
10. No unpleasant odors or dangerous fumes.
11. Absolutely safe—non-poisonous, non-inflammable.
12. Permits better operating temperatures.
13. Made to G. P. A. quality standards.
14. Lower in price. More economical than ever.

THE *New* **G.P.A.**  
RADIATOR GLYCERINE

GLYCERINE PRODUCERS' ASSOCIATION, 45 EAST 17th STREET, NEW YORK, N. Y.







**\$9<sup>75</sup> COMPLETE** (Ready to Install)

**T**OBE Engineers — after years of research and development in perfecting products for eliminating radio noises, or man-made static, now bring you for better radio enjoyment—a radio strainer—the “Filterizer.”



ON THE AERIAL

**TO GET MORE STATIONS  
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INSTALL THE “FILTERIZER”**

**N**O matter what make radio you have or where you live the “Filterizer” quickly installed at your receiver without any further attention definitely removes all unwelcome radio noises and only pure music and speech come through your loud speaker.



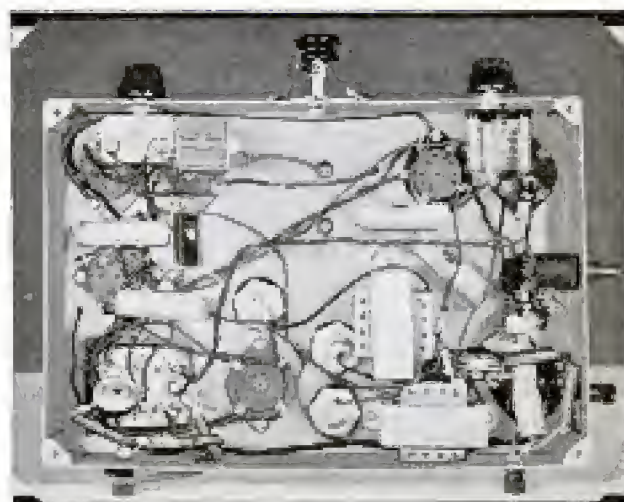
ON THE SET

*The acknowledged authority on Radio Interference—makers of FILTERETTES, the accepted remedy.*

**TOBE DEUTSCHMANN CORPORATION**  
FILTERETTE DIVISION  
CANTON, MASS.

## MAGIC BOX MAKES SENSITIVE SHORT-WAVE SUPER

(Continued from page 967)



Underside View of the Improved Magic Box Shows the Wiring and Arrangement of Parts

sum, Holland; LSG—Monte Grande, Argentina, S. A., and DJD—Konigs Wusterhausen, Germany.

It is quite easy to build, the parts being mounted on a simple metal subbase with all wiring underneath. The variable condenser used in this model was made by removing alternate plates from a two-gang .00035-mfd. capacity variable condenser. A unit of this type may be purchased, however, if desired. The total capacity of each section should be between 75 and 100 mmfd.

The intermediate-frequency transformer is a Litz-wound r.f. broadcast coil, shielded in a can. Any r.f. broadcast coil would probably answer the purpose, but the Litz variety is recommended. The cap lead for the r.f. tube should be connected to G-lug on the intermediate-frequency transformer. Any good vernier dial may be used. The one employed in the model is of the two-speed type, having a ratio of 5 to 1 and 40 to 1, and is quite helpful when tuning for weak signals.

The schematic circuit diagram is given in Fig. 1, and the simplified wiring diagram in Fig. 2. The simplicity of the parts layout will be noted in the photo above Fig. 2. These parts are all clearly indicated and named in Fig. 3. The metal chassis may be made of either craydo or aluminum. All parts are standard and available at low cost.

The plug-in coils are shown in the photo

(Continued to page 122A)



## FITTING NEW FLOORING

(Continued from page 979)

surface, as shown in Fig. 24. When a linoleum floor in good condition has one or more worn spots, these can be neatly patched as shown in Figs. 21 and 23. With linoleum cement and small remnants of material, you can often produce a colorful effect which will actually improve the original flooring. To do this, carefully cut out the worn section in a perfect square, triangle or circle. Cut out one or two other sections throughout the room to balance the new design. Then take two or three squares of different-colored linoleum of the same thickness and carefully fasten them together with rubber cement. Draw a design on the top square, and saw out this design on the triple thickness, as shown in Fig. 25, using a fine hand or power-driven scrollsaw. After that has been done, clean off the rubber cement and you are ready to make the inset. The various pieces of the three layers will fit together perfectly to make a tri-colored design. There is not any waste, as the remaining cut-outs can be assembled in a different color scheme to the other balancing insets.

## THE ART OF PICKING LOCKS

(Continued from page 893)

most effective, in especially difficult situations, are the sometimes crude tools made by the locksmith on the spot. One of them once prevented a suicide by using a closet hook and a short iron rod, curved at one end, to open the door of a room in which a woman was about to kill herself by jumping out of the window. It so happened that the window did not work easily, and by the time she had got it up, the door was thrown open and she was saved.

Another time the twisted prongs of an ordinary fork and the stub of a dinner knife, filed down to a triangle, served to open half a dozen locked doors in a burning building, thus saving the lives of people who had become too dazed by the smoke to open the doors from the inside.

In the ordinary course of business, the principal reasons why locksmiths are summoned, are carelessness, forgetfulness and sometimes the stupidity of the owners or their employees.

## Kill a COLD before It Takes Root!

**T**REAT a cold quickly and treat it *decisively!* Don't depend on half-way measures. Half-way measures only lead to half-cured colds.

Take a COLD remedy for a cold and not a remedy good for half a dozen things. Take a remedy that gets a cold from the *inside*, and not merely a surface treatment.

### 4 EFFECTS!

The wise thing to do is to take Grove's Laxative Bromo Quinine as soon as you catch a cold. Grove's Laxative Bromo Quinine is effective and reliable because it is specifically a cold remedy and because it does the four things necessary to relieve a cold.

First, it opens the bowels. Second, it kills the cold germs in the system and reduces the fever. Third, it relieves the headache and that grippy feeling. Fourth, it tones the entire system and fortifies against further attack. Grove's Laxative Bromo Quinine is safe to take! It contains no narcotics and produces no bad after-effects. Taken promptly, it will usually expel a cold overnight. So in its use lies safety. Every drug store in America sells Grove's Laxative Bromo Quinine. Convenient, pocket-size box, cellophane-wrapped. Get it today.



*"I Couldn't Write  
a Better Prescription  
Myself"*



# GROVE'S LAXATIVE BROMO QUININE



**Ease that sore spot  
and SLEEP**



"A little Sloan's will soon put an end to that twitching pain."

"I hope so. I've hardly slept since this last damp spell started."

## DAMP-DAY PAINS —stiff joints

Don't let pain keep you awake during damp weather. Warm those stiff sore joints with Sloan's—and you'll sleep soundly. For Sloan's rushes fresh blood to the sore spot, kills the pain, relaxes the stiffness. No rubbing is needed with Sloan's—simply pat it on. Gives the quickest relief in the world . . . and costs only 35¢!

### SLOAN'S

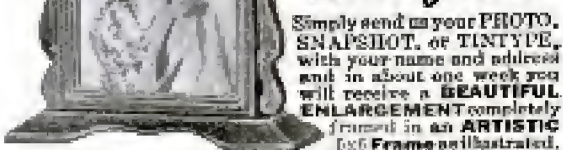
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## MAGIC BOX MAKES SENSITIVE SHORT-WAVE SUPER

(Continued from page 120A)

to on page 966. The oscillator coils are to be made first, and then the detector coils are made to match. The approximate number of turns will be given, but they will vary with the intermediate frequency used. This means that they will have to conform to the dial setting of the broadcast receiver which has been selected for best results. The detector coils may be made with a few extra turns on the grid winding  $L_2$ . Then tune in a station and take off a turn at a time until the best signal strength is obtained. The coil connections to the prongs in the bases of the plug-in forms are detailed at the lower left in Fig. 1. The two sets of small coils can be wound on tube bases, but the larger coil will require a regular plug-in form,

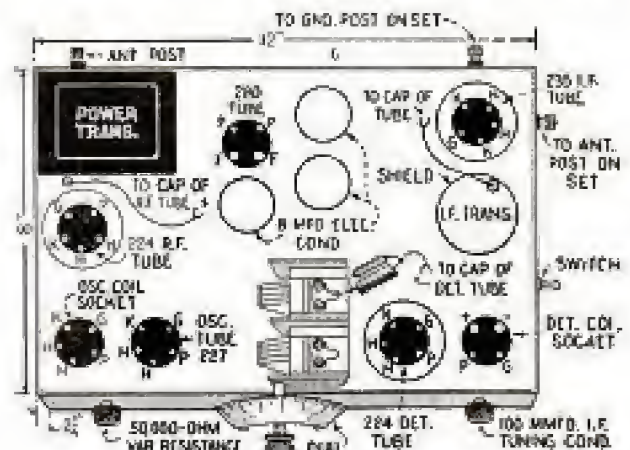


Fig. 3

or a 2¼-in. length of bakelite tubing may be fitted over tube bases to obtain the required length. The detector coil has a four-prong and the oscillator coil a five-prong base. The wire size is not critical, silk-enamel wire of any size between Nos. 24 and 30 being satisfactory. Readers who made the magic box, described in 1931, can use the same oscillator coils in this converter.

For the 15 to 40-meter detector coil,  $L_1$  has five turns and  $L_2$  five. For the oscillator coil,  $L_3$  has five turns and  $L_4$  consists of 7 turns tapped 2 turns from the bottom end. The 35 to 80-meter detector coil,  $L_1$  has 12 and  $L_2$  13 turns. For the oscillator coil,  $L_3$  has 12 turns and  $L_4$  17 turns tapped 2 turns from the bottom end. The 75 to 150-meter detector coil  $L_1$

(Continued to page 124A)

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Get Chemcraft Junior; you can do lots of experiments and tricks with it. Send 25 cents for yours now.

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## Send this Coupon for FREE Chemical Surprise

Tell us the name and address of the store near your home which sells toys, and we will send you a Free Chemical Surprise and full information about Chemcraft. Fill in this coupon and send it to The Porter Chemical Company, 1412 Washington Street, Hagerstown, Md. (If insufficient space write in margin below.)

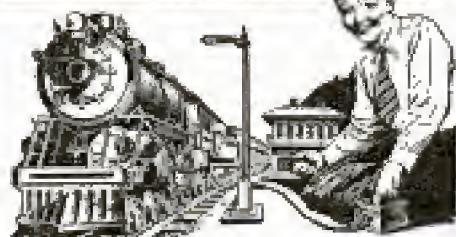
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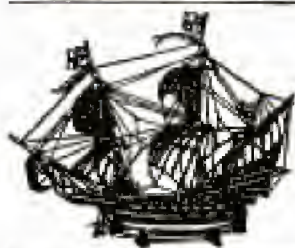
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in Stoves, Ranges, etc.  
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P. O. Drawer 1201  
NEW HAVEN, CONN.

**DEALERS WANTED**  
Write for Details

**MAGIC BOX MAKES SENSITIVE  
SHORT-WAVE SUPER**

(Continued from page 123A)

has 16 and  $L_2$  30 turns. For the oscillator coil,  $L_3$  has 10 turns and  $L_4$  21, tapped 2 turns from the bottom end. The coil chart together with enlarged layout and wiring diagrams are available in blueprint form for those who wish them.

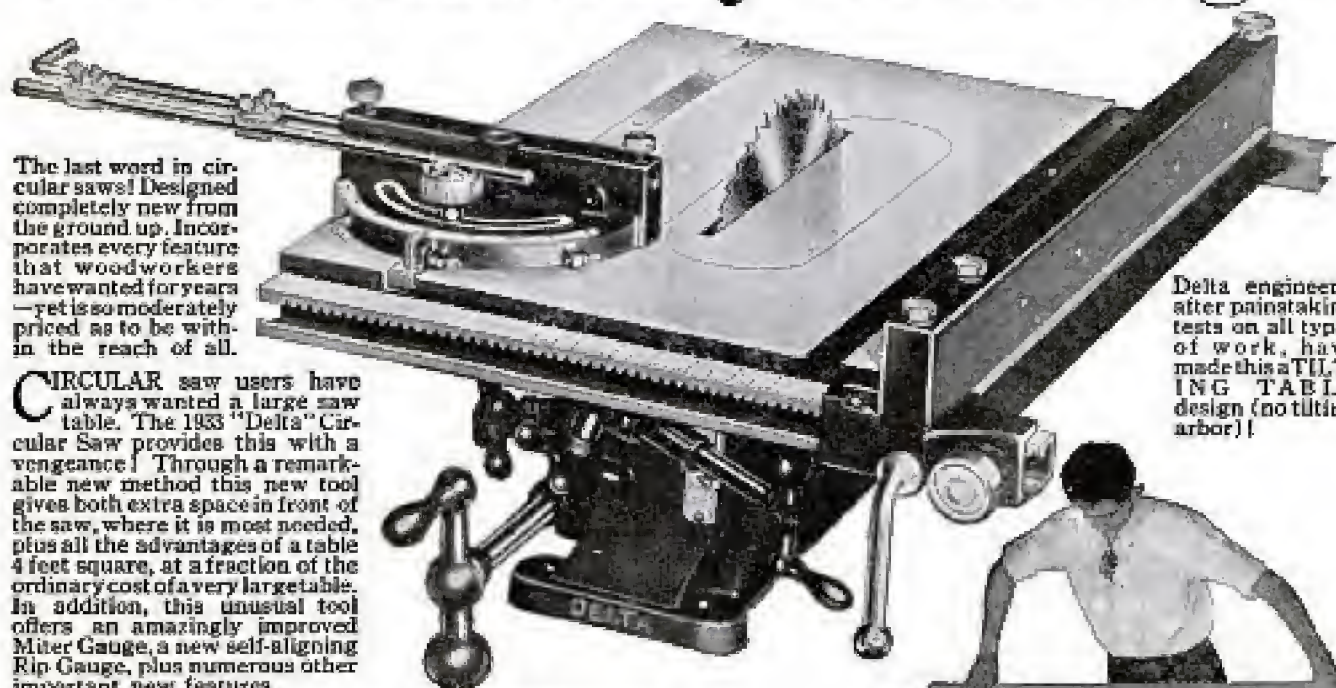
To put the converter in operation, place it near the broadcast receiver and plug in a set of coils. Connect a wire to the binding post indicated for the antenna-connection post on the receiver. The regular antenna is disconnected from the receiver and this wire is used instead. The regular antenna is then connected to the antenna post on the converter at the left in the rear. The regular ground is left on the receiver, but a wire should also be connected from this ground post to that on the converter. The receiver and converter are now turned on and the tubes allowed to heat. The dial of the broadcast receiver should be set at the high-frequency end, 1,500 kilocycles, as the short-wave coil-turn data given are best for this position of the broadcast receiver dial. The intermediate-frequency stage of the converter is now tuned to resonance as indicated by the background noise. When this noise is loudest, the stage is in resonance. Now tune the converter dial until a signal is heard, then adjust the variable resistor until the converter goes in and out of oscillation smoothly. This resistor may be left undisturbed when once adjusted for the best position.

If the broadcast receiver seems to work better at the low-frequency end of the dial, it will be necessary to connect a .00025-mfd. fixed condenser across the 100-mmfd. variable condenser that tunes the intermediate-frequency coil. Further information and a complete material list are available upon application. The entire cost of this highly efficient short-wave converter will range from \$15 to \$20. It may be housed in a midget cabinet.

⚡ In damp climates or during rainy seasons, the radio receiver may be kept free from moisture and in good operating condition if a 100-watt lamp on an extension cord is placed within the console and burned for several hours each day.



# New "Delta" Circular Saw Revolutionary in Design!



The last word in circular saws! Designed completely new from the ground up. Incorporates every feature that woodworkers have wanted for years—but is so moderately priced as to be within the reach of all.

**C**IRCULAR saw users have always wanted a large saw table. The 1933 "Delta" Circular Saw provides this with a vengeance! Through a remarkable new method this new tool gives both extra space in front of the saw, where it is most needed, plus all the advantages of a table 4 feet square, at a fraction of the ordinary cost of a very large table. In addition, this unusual tool offers an amazingly improved Miter Gauge, a new self-aligning Rip Gauge, plus numerous other important new features.

Delta engineers, after painstaking tests on all types of work, have made this a **TILTING TABLE** design (no tilting arbor)!

## A Complete Line of Efficient Motor-Driven Woodworking Tools



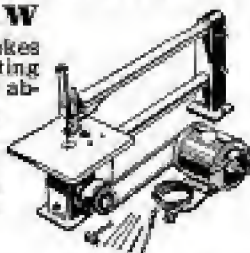
"Delta" Woodworking Units are convenient, portable and compact. All are available in a large variety of combinations and at prices to fit all needs. The "Delta" line includes Jointers, Circular Saws, Band Saws, Woodturning Lathes, Drill Presses, Scroll Saws, Boring, Routing, Sanding and Mortising Attachments, and a complete line of accessories.

### New "Delta" DRILL PRESS

The new "Delta" Drill Press, measuring 68 inches high and provided with heavy floor base, is a precision tool—built to meet the most exacting demands of production work, and yet priced unbelievably low. It incorporates numerous new features. Is really two machines in one—as the head can be reversed and used efficiently as a Shaper. Hollow Chisel Mortising Attachments available.

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Runs at full motor speed—1800 strokes per minute—all springing and twisting eliminated, with perfect balance and absence of vibration. Produces fine, smooth and accurate work. Has 24 inch throat capacity and will saw wood 2 inches thick! Works on metal and fibre as well as wood. It can be used for filing, sanding and honing.



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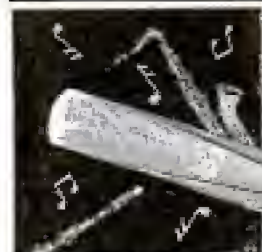
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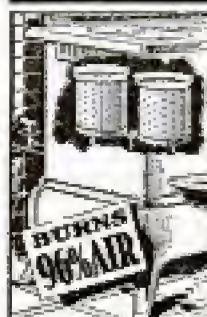
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## SECRETS OF THE LION MEN

(Continued from page 116A)

natives believe these men have the ability to transform themselves into lions, and remarkable tales of their powers were circulated. I was to be the only white man ever thus honored.

A few nights later I was awakened by a series of terrific roars and jumped up, gun in hand, to be confronted by a native dressed in the skin of a lion doing a savage dance. Outside my tent more roars and more lion-robed figures greeted me. They were the lion men come for the initiation ceremony.

Xipooso covered me with a magnificent lion skin, the head fitting over my head and the legs passing over my shoulders. I was led for miles, it seemed to me, until we came to a glen whose towering rocks shut it off from the rest of the world.

Then, all in chorus, the natives gave a leonine roar that could have been heard for miles. Almost immediately it was answered, and a large male lion came cautiously out of the bush to be met by an avalanche of spears. By sheer instinct, I too, threw a spear. The lion attacked, hurling himself twenty feet through the air, but he fell on the upraised shields of the lion men and was pierced to the heart by their spears.

Each warrior extracted his spear, the chest was cut open and the witch doctor removed the heart. Then, with the bloody point of the spears the witch doctor made a voodoo sign upon the forehead of each warrior and rubbed each chest with the still warm lion heart, leaving a shining smear on each black breast. As each warrior passed from the ceremony, he shouted his lion roar and began a grotesque dance.

When my turn came, I shrank from fulfilling my part, but was pushed forward by Xipooso and received the voodoo sign in blood on my forehead. Then, with a look of inspiration, the witch doctor ripped off my shirt and rubbed the lion's heart across my chest. I shouted myself a very proud roar, and tried to imitate the motions of the savage dance, meanwhile struggling frantically to keep my lion skin from falling off.

At last I was a member of the society of lion men with "a voice of command to make men and beasts shiver," so the witch doctor solemnly informed me.



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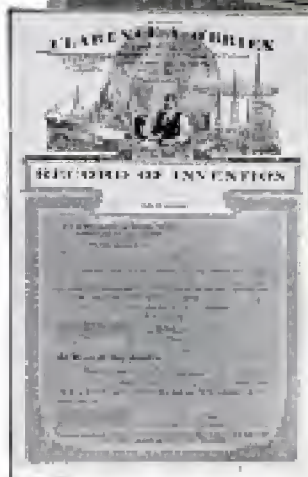
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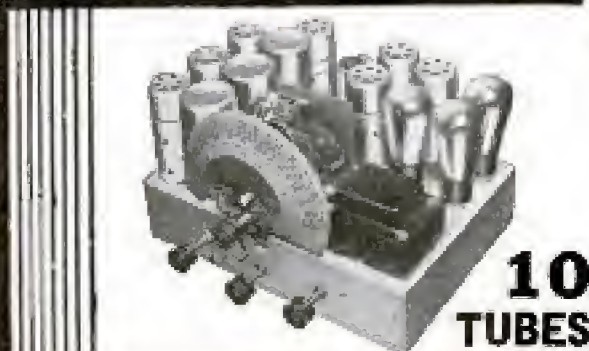


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## TUBES BRING IN SILENT TONES

(Continued from page 969)

to lower transformer costs and satisfy the power requirements of the new type C-46 tube. The third tube is the C-58, which is similar in appearance to the C-57. This tube is known as a triple-grid super-control amplifier. It produces less hiss and greater plate-voltage swing without distortion than the former type-35. In this respect, the C-57, previously mentioned, has the same advantage over the former type-24 tube. The fourth tube in the upright line is known as the C-46 and is a dual-grid power-output amplifier. It has great power output at relatively low plate voltage and is also capable of full volume range without overloading, or "blasting." It has excellent fidelity at high volume and allows tone compensation in speaker circuits. For multiple-speaker installations, the C-46 is ideal. Many of the new receivers are equipped with two or more special-range speakers to take full advantage of the tone range now possible. This tube makes such sets practical.

The large tube lying on the table at the extreme right is of special interest to amateur radio operators, as it is a new variety of the well-known 210 tube. It is designed to carry a maximum of 800 volts on the plate, as compared with 425, and the plate terminal is located at the top keeping it well separated from the grid. It is possible to use this new variety of the 10-tube in transmitting circuits that were not practical for it previously.

Another of the new tube family, not shown in the photos, is the C-55. It is known as a duplex-diode triode, and is a sort of double detector, or two tubes in one. It is adaptable to a number of circuit arrangements. Either single or double detection may be obtained, and one stage of audio amplification may be combined with one C-55. More new tubes may be coming, but this new group will be sufficient to keep the experimenters and set manufacturers busy for some time.

⚡ When shifting tubes in an a.c. receiver, always do so with the set turned off as the removal of a tube from the circuit will throw an extra load on the filter condensers in the power unit and may result in damage.



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## SOVEREIGN OF THE SEAS

(Continued from page 986)

solder it in place. Then, cut off one end of the pin flush with the edge of the fitting, and allow about  $\frac{1}{8}$  in. of the pin to project beyond the opposite edge. These pin fittings are to be attached to the rudder. The other seven, with open eyelets, are fastened in the notches on the sternpost. Place the respective fittings over the rudder first with the pins down. One at a time, clamp each fitting in place and, with a No. 70 pin drill or a needle ground flat at one end, pierce a hole entirely through the metal and wood. Press a lill through the hole, and solder the pin in place with just a touch of solder on each side. For the smoothest job, have your iron very hot so that the solder will flow around the pin freely. Then cut off the pin close to the fitting and file flush. Attach the sternpost fittings the same way. With the point of a knife, you can slot the hull on each side of the sternpost in line with the fittings so that their forward ends can be inserted slightly before pinning and soldering in place. This will make them more secure and strong to take any strains when the rudder is swung from side to side.

With the rudder completed and fittings in place, you will now hang the former. Line up a  $\frac{3}{16}$ -in. drill along the vertical center of the sternpost and drill a hole straight up into the overhanging curve of No. 5 hull lift. The hole may be about 1 in. deep. Press the rounded upper section of the rudder far enough into this hole to let the rudder fitting pins clear the tops of the sternpost-fitting eyelets. Then, swing the rudder forward so that pins and eyelets are in line, and pull the rudder downward with the pins through the eyelets. Bend the pins slightly below the eyelets so that the rudder cannot move upward. Last, trim off the bottom edge of the rudder on a line with the keel. This completes the rudder assembly.

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## SPYING ON THE INSECT WORLD

(Continued from page 240)

One man might devote a lifetime to the study of a single species and yet be unable to answer some of the questions that come pouring out a child's mouth about insects. They love. They fight. They even die in defense of that which is important to them. Do they also think?

Let us see if such a question arouses the contempt of Doctor Lutz after he has spent a week in the tropics contemplating the behavior of a colony of leaf-cutting ants. These creatures prepare a mold of their harvest of leaf pieces and in this soil grow a crop of fungi which they feed their young.

"Occasionally an ant carrier would get into trouble with its burden," he said. "At such times both outgoing ants and those that are returning to the nest unloaded gather round and pull the leaf this way and that. In the mix-up, the original carrier sometimes loses its piece of leaf, one of the others carrying it off. In these circumstances, the original ant, having been on its way to the nest, would have been expected on the chain-instinct theory to continue going there, but instead usually returned to the tree.

"In order to get enough observations to be fairly certain of this point, I robbed twenty carriers, pulling the leaf away with fine forceps. Usually the robbed ant would run about a bit as though looking for what it had lost and would spend a few seconds cleaning itself before setting out in earnest. Two of the twenty went on to the nest unburdened, but the other eighteen started back for the tree. To me it seems that these creatures think."

Here is a matter which fascinates entomologists. How, if these creatures do not think, can we explain the subterranean architecture of an ant city. Stone-age man was a reasoning creature, but his cave was a poor thing beside an ant queen's palace.

In defense of insects, any entomologist can muster an array of arguments perfectly astounding to persons who ordinarily think of them as mere pests to be exterminated. In the one fact that most plants are pollinated by insects and without them would be sterile, the strongest of these arguments is complete. Literally, the insect inhabitants of the world feed us.

(Continued to page 134A)



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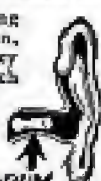
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## SPYING ON THE INSECT WORLD

(Continued from page 132A)

Among the mounted insects at the museum are several hundred thousand specimens of butterflies and moths under the direct supervision of Mr. F. E. Watson. In these gorgeous creatures there is a considerable traffic. There are many amateur collectors. Consequently there are dealers who quote surprising prices. For a pair of the Argema Mittrei from Madagascar, with their wings shaped at the bottom in long tail-like pieces, from \$50 to \$60; for a pair of Coscinocora Hercules from New Guinea, with wings nine inches from top to bottom, \$25 up; for a death's-head moth, around \$2 each.

In such matters, the scientists profess to be totally uninterested. They are much more concerned with solving a mystery concerning the habits of a common American butterfly for which no dealer would give as much as two cents. This is the Monarch, a flyer of terra-cotta color which goes southward at the end of summer. Is it a true migrant? Do the same individuals that go south fly north in the spring to the scenes of former adventures? Scientists are determined to find an answer. One caught about 900 and punched a small round hole in the wing of each before releasing it. None of the marked specimens was returned. Doctor Lutz now has a scheme for staining the wings with some aniline dye. It is his belief that if this is done with thousands of Monarchs, and the purpose widely published, it may result in disclosing where these long-distance butterflies go and whether it is they who return next year or merely their progeny.

The eyes of a collector, alert to much that escapes most of us as we motor swiftly over rural highways, sees in a single day a bewildering and fascinating universe of passion. He sees a mantis, as dreadful to her victims as a crouching tiger to an unarmed man, waiting with trap-like front legs bent to seize a hapless insect crawling toward it. He sees splendid enterprises as when he focuses his gaze on the industry of leaf-cutting ants. He gazes down upon frightful and savage raids as when a band of army ants capture the citadel of wasps. He looks upon admirable industry and wonderful and diverse mechanisms of existence.



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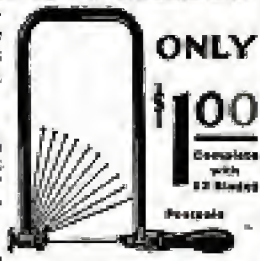
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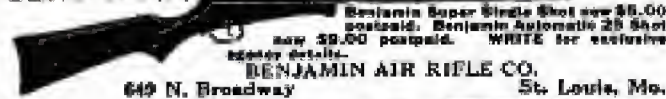
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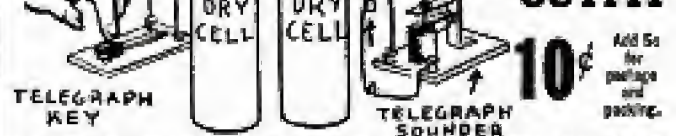
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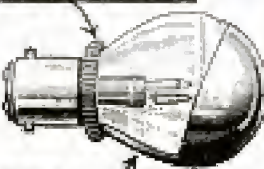
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## HOW TO BECOME A CHAMPION

(Continued from page 939)

the Garden, Hack won. He was the new champion. He had a splendid physique, no doubt about it. He weighed 215 pounds and was the most agile man of his size I have ever known. I have seen him take a fifty-pound dumb-bell in each hand and do a forward somersault over a kitchen table. He was like a panther; also he was dignified, well educated and a fine character. Unfortunately he knew how to quit.

"Jenkins, from whom Hack had won the championship, had previously beaten Frank Gotch, so when Hack was matched with Gotch, I guess he thought it would be easy. He did not train as carefully as he should. When I was training him, he used to work out hours every day, wrestling and lifting heavy weights. Then, to limber up, he would fool around with light dumb-bells and skip the rope.

"If you have been lifting any heavy weights, it is always a good idea to relax by finishing up with light dumb-bells. The rope skipping is designed to make a man light on his feet. All these things are important in the conditioning of an athlete. Champions can't do without condition. You've got to work for that. It does not come wrapped up in a package.

"Well, when Hack, having neglected his training, got on the mat with Gotch out in Chicago, he found himself grappling with the roughest, toughest man he had ever met. At Hack's best, I think he might have beaten Gotch, but he was not at his best, and, then too, he lacked something that a champion must have. Gotch got a toe hold on him. Rather than have his leg broken Hack rolled over on his back and ceased to be the champion. Thereafter he was called yellow."

John L. Sullivan was another acquaintance of Bill Brown's who threw away a championship by neglecting the rules of training.

"That fellow," said Bill, "need not have been licked for years if he had taken care of himself and learned how to box. He was a natural fighter who depended on his strength to beat down lesser men. Corbett was too clever for him. The first time I met old John L. was right after he had lost the championship to Corbett. Bothner and I were giving an exhibition at Grand

(Continued to page 138A)



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in the new business-profession of correcting foot troubles without medicine, surgery or chiropody. Learn at home in spare time. Easy Terms. Earn while you learn. No capital needed. Write today for full information free.

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**Don't Throw Away That Coat and Vest!**

Let us match your coat and vest with new trousers tailored to your measure. Save the price of a new suit, over \$50.00 garments. Mail sample of suit, or vest and, which will be returned with FREE sample for your approval.

**Match Pants Co., 20 W. Jackson Blvd., Room 1104, Chicago**

## \$100 Jig Saw

15" long—9" high. 6 1/2" table. All metal construction. Sent postpaid on receipt of \$1.00. (Canada, \$1.35.) All C.O.D.'s 25¢ extra. FREE booklet "Make Your Own Jig Saw Puzzles" with every saw.

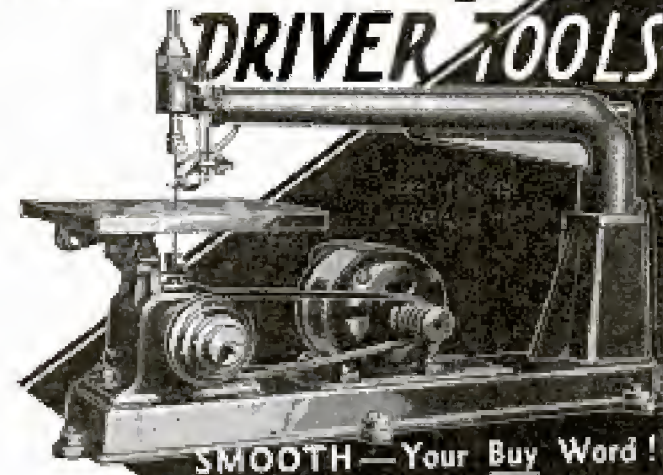
**J. & H. METAL PRODUCTS CO., Dept. 12, Rochester, N. Y.**



Make money selling this newest pocket screw driver, "POWERFUL PETE." Fits the pocket, watch chain or key ring, turns almost any screw. Nine out of ten people will gladly pay a dime for this neat, practical little tool. Make a nice profit and give real value. Send a dollar for 20 post-paid. **Trumont Mfg. Co., 55 Amory St., Boston, Mass.** Established 60 years.



# 1933 FREE Catalog



**SMOOTH—Your Buy Word!**

Smooth in operating, smooth in appearance! New 24 in. Driver Jig Saw. Has grooved roller guide, spring hold-down, heavy tilting table. Arm removable for sabre sawing, sanding, filing. Ask your dealer for demonstration and prices or send the coupon furnished at the left to us.

WALKER-TURNER CO., INC. PLAINFIELD, N. J.  
DEPT. AA Please send 1933 catalog of all new tools.

## ARMATURE REWINDING



Complete rewinding to original factory specifications. All work **unconditionally guaranteed**. 24 hour service. Vacuum cleaner, electric fan and portable electric drill armatures a specialty, at low prices. Special Re-New Western Electric Cleaner, rewound new \$60, surplus price \$7. Complete attachments \$3. Special Rewound vacuum cleaners—Hoover, Franks, Duplex, Royal, Kirsch, etc.—guaranteed one year—\$4.75 and up. Attachments and replacement parts at all makes. Write today for free folder and price list.

Dealers—Agents—Get Our Money-Making Plant!

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New 1933 Model, Complete with Mike Ring and Handle

**95¢**

POSTPAID

Master Mike Co., 4808 Grand River, Detroit, Mich.

Reproduces your own voice through your radio. Boats your friends. A million dollars' worth of fun. Easy to connect. Fits any radio. A real microphone—not a toy. Mailed postpaid, only 95¢. Send today.



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Down for a

**3 H. P. WITTE**

(Throttling Governor)

**EASY On Best TERMS Engine Built.**

**LOWEST PRICES IN 20 YEARS**

Uses Gasoline, Kerosene, Distillate or Natural Gas. Removable Die-Cast Bearings, Grease Cup Lubrication, Waterproof-Trouble-proof Magneto, Easy starting device. Big surplus power with lowest fuel and oil expense. Other sizes and styles, 1½ to 30 H.P. Also 3 styles Saw Rigs.

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**FREE** Write today for My Big Engine Book—No Obligation.



289-p Carson St.  
Pittsburgh, Pa.

**WITTE  
ENGINE WORKS**

1749 Oakland Av.  
Kansas City, Mo.

## HOW TO BECOME A CHAMPION

(Continued from page 136A)

B1459  
Central Palace—some benefit performance. The ex-champ was on the bill and shared our dressing room. I came back from our match with my tongue hanging out, and the big fellow offered me some of the beer he was drinking. I thanked him and explained I had never tasted it in my life. Then the ex-champ gave me a sorrowful look, saying: 'I wish John L. could say that!'

Bill Brown, for whom gameness is a fetish, wants that quality in his horses and dogs. About six or eight years ago he made the acquaintance of a ragged terrier breed, the Kerry Blues. Since that time he has had little use for other breeds. Now there must be a couple of dozen of these tough little fellows running about his farm.

"If one of those dogs dives in the duck pond after a muskrat," said Bill, "you can be sure he won't come up without the rat. If they get in a fight, and they'd rather fight than eat, they keep tearing in as long as they can stand or until the other dog is dead or whipped. They are champions in their hearts. There are men like that."

"After all, Bill" I argued one day, "everybody can't be a champion."

"No," conceded Bill, "everybody can't be a champion. What I'm trying to tell you is that anybody can be a champion who wants to be strongly enough to let nothing interfere with his desire. You know very few men in the world have ever developed their powers to the utmost."

It was not until the end of my week of training that Bill Brown gave me the real recipe for becoming a champion. It seems to me to be one any young fellow ought to paste in his hat.

"Look," said Bill, "becoming a champion is not just a matter of whipping half a dozen fellows that are supposed to be better than you. The one you must lick is yourself. That's a fight you must win every day, time after time. Will that chocolate soda or that glass of beer put on fat you are trying to take off? Will that party rob you of sleep and strength? Those are the kind of fights I mean. No one who regularly loses battles with himself can ever be a champion. But the beauty of winning is that your will power develops with use just like the muscles of your body."



# Save on Your Christmas Gifts



**MAKE** three friends happy on Christmas and all the rest of the year—besides saving \$1.50 for yourself. A gift subscription to Popular Mechanics Magazine is a reminder every month for 12 months and can't be beaten as a gift for a man or boy.

Every issue of this entertaining and valuable magazine contains 176 pages and over 400 pictures of fascinating events in every corner of the world. The Romance of Modern Progress is told in pictures and simple language. Radio enthusiasts, home craftsmen and practical shopmen are shown countless "easy-to-make" conveniences that save time, labor and money.

Order three subscriptions, save \$1.50. Price for one year is \$2.50 but until January 1, 1933, you may order 3 one-year subscriptions for only \$6.00—and an engraved Christmas card will be sent to each subscriber for you.

3—one-year subscriptions \$6.00

1—two-year subscription \$4.00

1—one-year subscription \$2.50

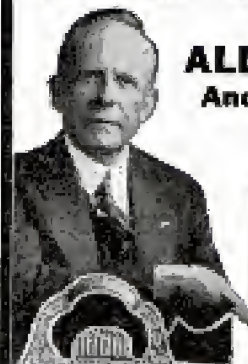
Foreign and Canadian subscriptions 50c a year additional.

Mail your order to:

Xmas Gift Dept., Popular Mechanics Magazine  
200 East Ontario St., Chicago, Ill.

**\$ 7.50 for \$ 6.00**

## Santa Fe Smashes!



**ALL WATCH PRICES**  
And in Addition We Give You

Your Choice of

A Beautiful Blanket  
A Diamond Ring or  
A Chest of Silver

**FREE!**

(Thirty Days Only)

**With Each Purchase As Explained in Our Sensational Offer Now Ready to Mail! Send Coupon for It NOW!**

Our "Direct To You" unheard of low wholesale prices are absolutely at rock bottom, and our special distribution plan will mean huge savings to you. This is all explained in our new catalog just off the press. Send for it at once—don't miss grasping this sensational offer which is startling the country.

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**A NEW**

**EMPIRE LEVEL**

**Ideal Xmas Gift**

No workshop is complete without a level. The new Empire Telescopic Level is ideal for the homeowner. Its shape eliminates all sharp corners. The frame is die-cast aluminum. 9" long. Weighs only four ounces. Bottom is grooved to fit on pipes and stanchions. In addition to plumb and level, it has a 45-degree glass. Plumb readings on level glass. **Special Introductory Offer!** Send us only \$1.25 and we will ship you one of these levels. Test it out. Then if not satisfied, return the level and we'll refund your money. **Lifetime Free!** **EMPIRE LEVEL MFG. CO.** 716 So. Sixth St., Milwaukee, Wis.



**IDEAL Spad Vought Corsair Lockheed Sirius**

15 in. Size

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**SELLS ON SIGHT!**

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A real opportunity to those who act quick. Live sales prospects everywhere. Write today—right now—for descriptive literature, agent's low prices and full particulars.

**THE J. H. MACE CO., 350 Mace Bldg., Kansas City, Missouri**

## HOME-BUILT TRANSFORMERS

(Continued from page 1021)

select a core of the next larger size. In changing the core size, divide the cross-sectional area of the core, as given in tables No. 1 to 4, by the width of the new core, to find the proper thickness to use. For low-voltage transformers, where the amperage is high, it is best practice to wind several small wires side by side at the same time, connecting them together at each end, instead of using a single large wire. The total circular-mil area of the small wires must be equal to that of the single wire for which they are substituted. Welding transformers, passing several hundred amperes, should have secondary windings of heavy copper ribbon or strips of sheet copper. To figure the number of amperes a strip of copper can carry safely, multiply the width by the thickness to get the cross-sectional area in square inches, and multiply this product by 1,275. Copper ribbon or strips of sheet copper are insulated before winding by wrapping them with plain linen tape or strips of varnished cloth. All splices must be well soldered.

## WOODCRAFT IN THE WOODS

(Continued from page 201)

And here is one from the north country. You are following three moose. Quite evidently one is a bull. A very large and less pointed hoof mark shows this. The three walk behind each other. Suddenly the bull leaves the trail and swings around two trees while the cows remain on it. This is an excellent illustration of the fascination of this game of woodcraft. Why does the bull move off in order to pass two trees standing opposite each other and about six feet apart?

The answer is easy when you know how to figure it. The bull must have had a dandy set of horns. When he came to the trees, he had to think about getting his wide spread of antlers between them. If he had been a young bull or even an old one with a small set of horns, there would have been no such problem. We followed this trio in the hope of getting a shot at the bull. We knew that he must have a magnificent set of horns.

So the woods offer many challenges to the man who uses his eyes.



## NEW MECHANICAL DEVICE SAVES YOU MONEY WHEN YOU STOP AT

# The Sinton-St. Nicholas

The hotel of character in a city of character

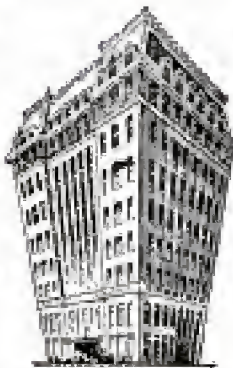
Alert! Up-to-date! Modern. Even the economy of a painting device which saves the hotel \$20,000.00 a year is passed right on to you—giving you the finest accommodations at lower prices.

You'll find the Sinton-St. Nicholas a pleasant place to live on your next Cincinnati visit.

**750 ROOMS**  
with bath, shower & servitor  
from **\$2.50**

JOHN L. HORGAN, Managing Director

# CINCINNATI



**DO YOU WANT TO STOP TOBACCO?**

Banish the craving for tobacco as thousands have. Make yourself free and happy with Tobacco Reformer. Not a substitute, not habit forming. Write for free booklet telling of injurious effect of tobacco and dependable, easy way to relieve the craving many men have.

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Dept. 900 St. Louis, Mo.

**FREE BOOK**

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Build the Royal Sovereign

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**CATALOG 15¢**

**CRESCENT**

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**SOLVES MAN'S GREATEST PROBLEM**

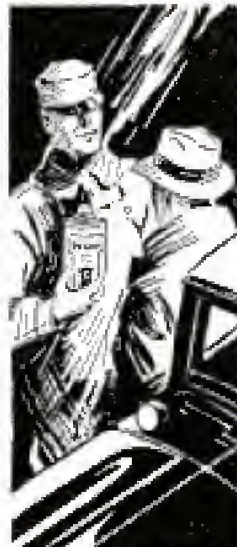
Let me send you world's greatest shaving invention on 30 days' trial and show you how you can actually "earn" money with it. I'll prove it means Keener, smoother shaves and 50% saving in blades. I'll show you how to **MAKE UP TO \$75 WEEKLY** merely handing it out on FREE TRIAL. Send no money—just name and address. Our new guarantee offer enabled Clifford to make \$22 in one day. No risk! Write at once.

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# PYROIL

(Simply Add to Gas and Oil)



Pyroil guarantees quick, easy starting in coldest weather. It establishes its own self-lubricating surface on all frictional parts—proof against cold, against heat, wear and dilution. When oil is sluggish, congealed, the Pyroil self-lubricating surface protects against damage until circulation is freely effected. Builds lubrication into the metal. Pyroil increases power, frees valves, seals rings. Saves on oil and gas.

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**1¢ Mends a Hole** | **New Half Soles as Low as 4 1/2¢**

New—Improved—"mystery discovery" called **Re-sole** ends high cost of shoe repairs. Anyone can now put on brand new soles and heels and repair holes. Spreads on in a minute with knife. No nails or tools needed. Dries hard and smooth. Wears better than most leather. Flexible, waterproof, comfortable. Guaranteed.

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if you don't make a single sale. **Re-sole** is a hard time seller. Millions need it to save money. Agents make up to \$10—\$15—\$25 a day. Wilson of Wisc. made \$75.00 in one day. Hundreds amazing profit records. Send for **FREE offer of Full Size Can**—enough for 20 soles. Send no money. No obligation. Free Sample on leather will be sent with proof of big money other agents are making. The hottest seller of the age. New "million dollar" plan for Agents. Rush coupon or postal card today.

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Send offer of full size can and sample on leather. No obligation. Also send proof of big profits and new plan for agents.

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## RE-SEAT VALVES While Motor Runs

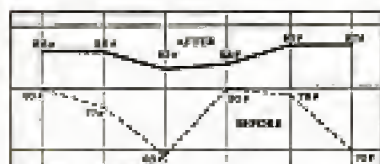


This is the simple new treatment that makes valve grinding unnecessary, described on page 752 of November Popular Mechanics. Latest offering of A. P. Warner, inventor of the automobile speedometer.

# WARNERIZE

Any one can apply to motor in a few minutes. Saves \$1 to \$20. Leaky valves lose power, waste gas, cause poor performance. WARNERIZE re-seats every valve. While the car is running. Users say it brings back all the "pep" the car had when new. More power, greater speed, better pick-up. Indianapolis Fire Department uses WARNERIZE in fire equipment and chief's car. Cannot harm motor in any way.

### Increases and Equalizes Compression



WARNERIZE increases compression as much as 32%. Graph shows typical compression improvement. See "Battle of the Octanes" Page 698, November Popular Mechanics explaining how increasing compression increases horse power.

We guarantee improved performance from WARNERIZE or money back. If dealer cannot supply, send us One Dollar with your name and address for a package of WARNERIZE, postage prepaid. If not satisfied with results, return the can and we will refund your dollar.

WARNER-PATTERSON COMPANY, 593 S. Michigan Ave., Chicago



### NEW ARMY PURSUIT "FLIES 1300 FEET!"

75c. Easily built. Fits great A. real Army fighter in look. comes with! Servant. COM- FLETS kit in box! The prepaid

## FREE! "Flew 900 Ft."

Make Glider Free with each kit! First Order sent!

**EASY TO BUILD**  
Dipped piece of ground, has flown 900 ft., weighs 1.25 lb. COMPLETE KIT is big box, 50c prepaid! Satisfaction Guaranteed or money back! Cash or C.O.D. Catalog 3c stamp. COMET MODEL AIRPLANE CO. 3114 Harrison, Dept. PM-122, CHICAGO



## WOODCARVING



ONLY \$3.50  
Postpaid

### New WHIT-L- KRAFT Knife!



Not just another knife—it's a whittling tool. 4 blades, each for a particular type of whittling. Has big blade, small blade with 45° angle point, "hollow-chisel" blade and scraper blade. Price only \$1.50 postpaid.

**NEW...** At last you can get a complete set of wood, soap and linoleum carving tools never before available except in expensive, imported sets at five times the cost.

Designed by professional woodcarvers. Set contains 6 tools: 1 Upright Flat Chisel with 45° angle point for outlining and as a reiner; 1 Flat Curved Chisel for leveling flat background work and bas-relief; 1 Gauge 3/4" for preliminary work and finer cuts; 1 Gauge 1/4" for slightly deeper work; 1 Gauge 1/2" for deep relief, etc.; 1 Slip Stone for sharpening, shaped to fit all tools. All tools are forged, electrically hardened and carefully ground and finished. Housed in polished hardwood—a permanent kit for the tools.

This wonderful set, judged by professionals as equal to other sets costing \$15.00, costs you only \$3.50 postpaid. Send C. O. D. if desired. Satisfaction guaranteed.

**CATTARAUGUS  
CUTLERY COMPANY**  
Dept. P. M.  
Little Valley, N. Y., U.S.A.

## GOLD WASHERS INCREASE PROSPECTORS' EARNINGS

(Continued from page 118A)

The clapper is a 5½-in. bell-shaped piece of soft leather, fastened with a wooden strip and weighted with a ¼-in. piece of wood large enough to cover the hole. A strip of canvas is tacked to the bottom of the frame and around and over the bottom board before putting on the hinges, to prevent loss of air through this crack. The bellows cloth, applied next, consists of a piece of buckskin or heavy rubberized cloth, cut to the shape and size indicated. It should be tacked firmly, with covering strips, to the bellows frame and to the sides of the bottom board. Wooden blocks, screwed to the bottom of the bellows, hold a ¾-in. steel rod, to the ends of which 9-in. hardwood connecting rods are attached, their upper ends being fastened to the pulleys eccentrically. The frame of the riffle board is covered with a sheet of standard-mesh window screen, on top of which is placed a layer of unbleached muslin, both layers being tacked to the frame. The side walls are shouldered to fit under the cleats inside of the bellows box. Riffles, consisting of ½-in. quarter-round molding, are nailed down to fit over the muslin. The riffles point toward the back, so that heavy material cascading down the board will be caught on the undercut faces. A handle is attached to the front of the riffle board for convenience in removing it. Four legs are attached to the bellows box and hopper with wingbolts for ease in dismantling. To operate the dry washer, the dirt is shoveled into the hopper screen, the fine material passing through and falling into the hopper. Turning the handwheel causes the bellows to force air up through the cloth bottom of the riffle board, vibrating the light material up and over the riffles until it falls on the ground. To make a clean-up, remove the riffle board and submerge it in water, pounding it until all the material that has collected behind the riffles has been freed.

Like the wet rocker, the dry washer requires careful adjustment to separate all the gold dust out of different soils and sands. The adjustments consist in changing the slope of the riffle board by propping up either end of the machine, and controlling the flow of material from the hopper by means of the cut-off gate.



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Agents Earn **\$100** A Week  
Up to

PAT.

**IDEAL XMAS GIFT**

Just show any car owner how to tell gas tank tappers and the sale is made. Fits all cars.

**Automatic Gas-Lok**

New, necessary invention. Millions of gallons of gasoline are siphoned out of tanks by private and public spongers, parking places, at car washes, etc. Thousands of cars are lost, too. This amazing gift positively prevents such losses. It stops siphoning. Beautifully finished. Sells for \$1.50 with two keys. Big discount to agents. Send \$1.00 for sample. Credit for sample allowed on first order for a dozen.



**AUTOMATIC GAS-LOK MFG. CO., 21 E. Van Buren, Dept. 41, Chicago, Ill.**

## New Kind of Shoe Sole!

**STRANGE "MAGNETIC" SHOE SOLE** applies itself without nailing or sewing. Low priced. Outwears leather. Cuts shoe bills in half. Comfortable. Water-proof. Scientific Non-Skid Tread. Banishes costly shoe repair bills. Everyone buys. 100 agents wanted at once. **AGENTS!** weekly. No experience needed. We show you how. **Outfit Free.** Territories going fast. Write quick! **Kristen Mfg. Co., 1362 Bar St., Akron, O.**

Outfit  
FREE

**BURN YOUR NAME ON TOOLS****WITH THE ARKOGRAF****PROTECT YOUR TOOLS FROM THEFT**

Write with electricity your name or design on the hardest and finest tools and instruments, or any metal, like writing on paper with pen or pencil. Complete Outfit \$3.50—**Postal Agents** interesting illustrated circular free. Write today. Agents wanted. **ARKOGRAF PEN CO., 1170 E. Stark St., Peoria, Ill.**

**GEARS****In Stock—Immediate Delivery**

Gears, speed reducers, sprockets, thrust bearings, flexible couplings, pulleys, etc. A complete line is carried in our Chicago stock. Can also quote on special gears of any kind. Send us your blue prints and inquiries.

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World's Largest Ski Manufacturers

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**SAIL on SKATES**

Tacks into wind or sails before it. 32 sq. ft. of strong canvas on light weight Ash frame. Folds to carry. Patent pending. Price \$7 complete.

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**LIMA - OHIO**

**LET THIS XMAS BRING YOU THE GENUINE THRILLS**

**AK FIGHTER E9C-2**  
4 1/2" scale. Span 16 1/8"; length 15 1/8"; weight 2.2 oz.  
Colored silver, blue, black.  
Complete kit \$7.95.  
Complete kit \$9.95, only.

that come only with building authentic Cleveland-Designed Flying Models

**GREAT!**

"Cleveland Model Engineers (CME)!" Every body's reading it. Nothing out like it before. Book your name, get free and \$2 (no stamp) for your copy.



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Complete kit \$2.50, only.

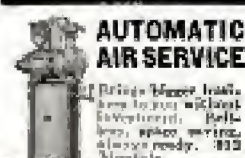


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1 1/2" scale. Flies 25 m.p.h. Span 15 1/8"; length 15 1/8"; weight 2.2 oz.  
Yellow and green. Complete kit \$2.50.  
Complete kit \$3.50, only.



**HOWARD RACER—1 1/2" scale.** Colored with Cleveland's new white dope. Span 15"; length 15 1/8"; weight 1.5 oz. Complete kit \$1.50.  
Complete kit \$2.50, only.

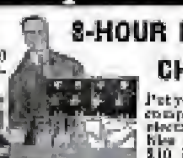
If your dealer can't supply you, order direct: **CLEVELAND MODEL & SUPPLY CO., 1688-212 West 51th St., CLEVELAND, OHIO, U. S. A.**

**PROFITS \$160 to \$300 Monthly—WITHOUT INVESTMENT****AUTOMATIC AIR SERVICE**

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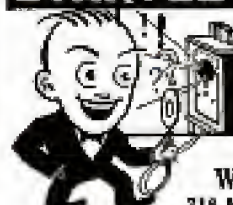
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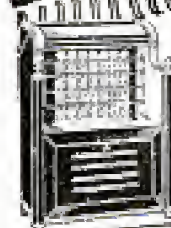
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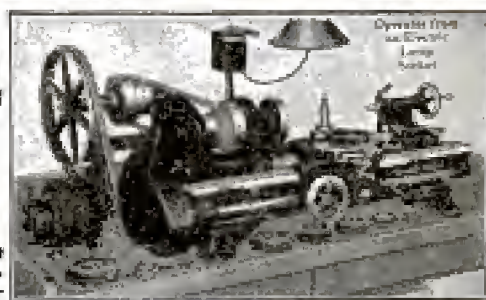
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Wt. 240 lbs.

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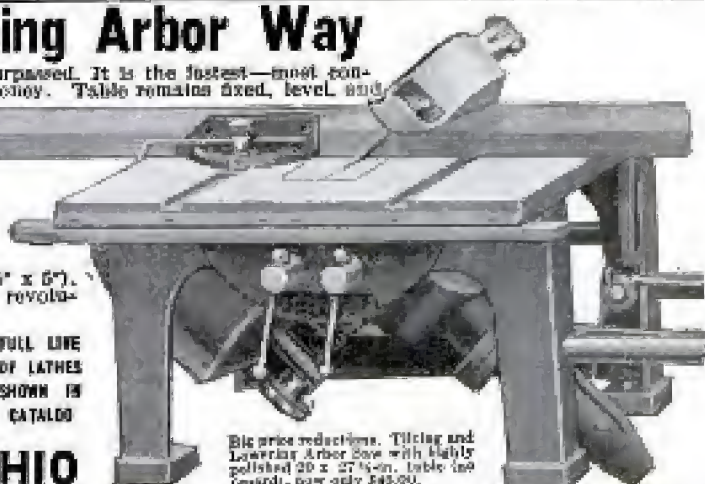
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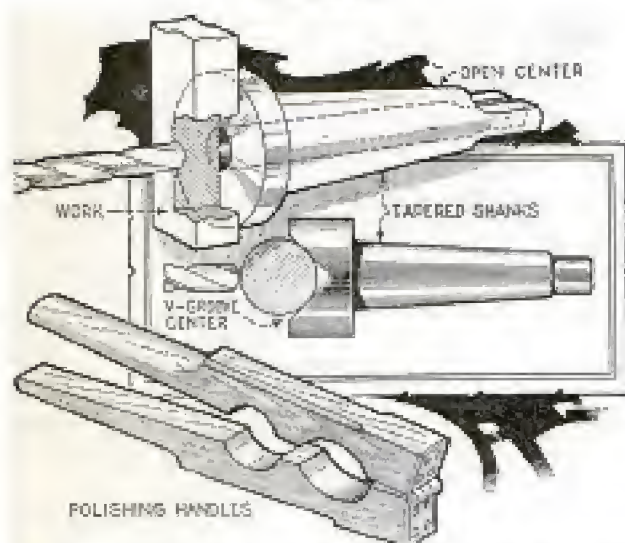
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(Continued)



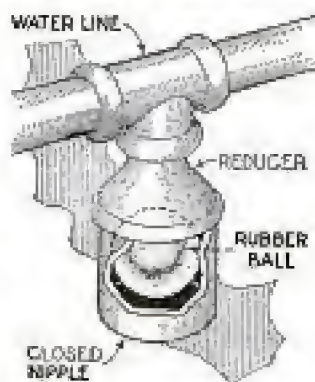
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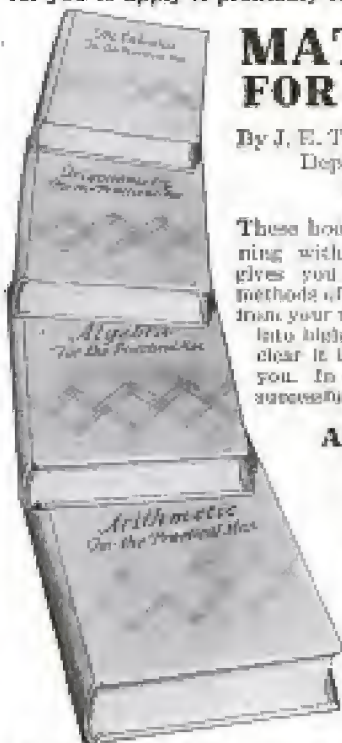
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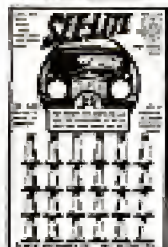
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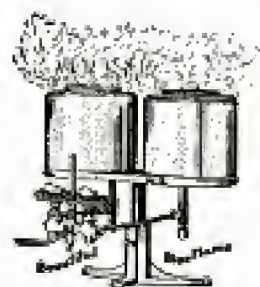
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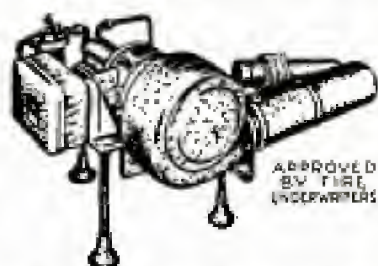
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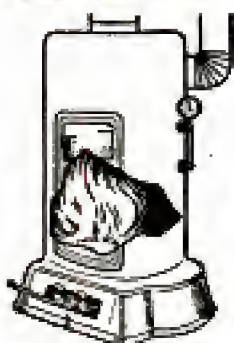
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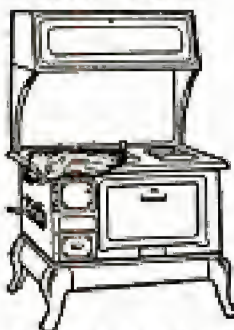
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28x4.50-62	2.50	32x4.5	2.35
28x4.50-63	2.50	32x4.5	2.35
28x4.50-64	2.50	32x4.5	2.35
28x4.50-65	2.50	32x4.5	2.35
28x4.50-66	2.50	32x4.5	2.35
28x4.50-67	2.50	32x4.5	2.35
28x4.50-68	2.50	32x4.5	2.35
28x4.50-69	2.50	32x4.5	2.35
28x4.50-70	2.50	32x4.5	2.35
28x4.50-71	2.50	32x4.5	2.35
28x4.50-72	2.50	32x4.5	2.35
28x4.50-73	2.50	32x4.5	2.35
28x4.50-74	2.50	32x4.5	2.35
28x4.50-75	2.50	32x4.5	2.35
28x4.50-76	2.50	32x4.5	2.35
28x4.50-77	2.50	32x4.5	2.35
28x4.50-78	2.50	32x4.5	2.35
28x4.50-79	2.50	32x4.5	2.35
28x4.50-80	2.50	32x4.5	2.35
28x4.50-81	2.50	32x4.5	2.35
28x4.50-82	2.50	32x4.5	2.35
28x4.50-83	2.50	32x4.5	2.35
28x4.50-84	2.50	32x4.5	2.35
28x4.50-85	2.50	32x4.5	2.35
28x4.50-86	2.50	32x4.5	2.35
28x4.50-87	2.50	32x4.5	2.35
28x4.50-88	2.50	32x4.5	2.35
28x4.50-89	2.50	32x4.5	2.35
28x4.50-90	2.50	32x4.5	2.35
28x4.50-91	2.50	32x4.5	2.35
28x4.50-92	2.50	32x4.5	2.35
28x4.50-93	2.50	32x4.5	2.35
28x4.50-94	2.50	32x4.5	2.35
28x4.50-95	2.50	32x4.5	2.35
28x4.50-96	2.50	32x4.5	2.35
28x4.50-97	2.50	32x4.5	2.35
28x4.50-98	2.50	32x4.5	2.35
28x4.50-99	2.50	32x4.5	2.35
28x4.50-100	2.50	32x4.5	2.35

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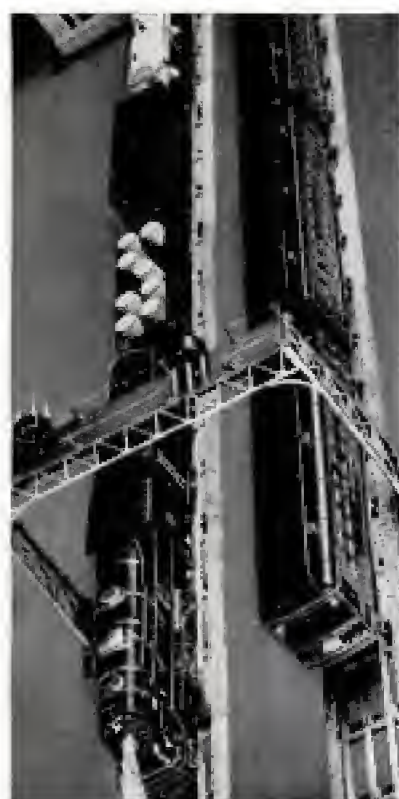
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